

THE UNITED STATES ARMY MEDICAL DEPARTMENT JOURNAL

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Perspectives

COMMANDER'S INTRODUCTION

MG David A. Rubenstein

The Army Medical Department Center and School is, first and foremost, an educational institution. For many years it has been charged with imparting the knowledge and skills necessary to ensure our country's Warriors receive the finest medical care possible, wherever and whenever it is needed. That mission is currently expanding dramatically as the facilities morph into the all-service Medical Education and Training Campus, centralizing all basic and most specialized enlisted military medical education at one location at Fort Sam Houston, Texas. It is, therefore, both appropriate and timely to publish an issue of the *AMEDD Journal* highlighting various aspects of the education responsibilities and functions within the Army Medical Department.

Definitions of the verb "educate" vary somewhat from source to source, but such variations are largely in style.

Consolidating the kernels of those definitions, one finds that educate means:

- To provide with training or knowledge, especially via formal schooling.
- To provide with training for a specific purpose, as a vocation.
- To provide with information.
- To stimulate or develop the mental or moral growth.

The AMEDD Center and School (AMEDDC&S) fulfills every element of that definition in the education of all of its students. Indeed, as with all military service schools, students must attend classes in leadership, responsibility, ethics, and morality, in addition to professional skill knowledge, something that is rare today in many civilian learning environments. We are proud of the military healthcare professionals that leave our school to join America's Warriors throughout the world.

EDITORS' PERSPECTIVE

COL Randall Anderson opens this issue of the *AMEDD Journal* with an overview of one area of a collaborative "brainstorming" effort by a large group of AMEDD subject matter experts to project AMEDD's operating environment 30 years in the future. COL Anderson focuses on their ideas with regard to how AMEDD will educate and train medical personnel, based on trends in education, healthcare, and the military. The ideas are at once intriguing, exciting, and obviously challenging, because major adjustments to design and delivery of academic material would be forthcoming, along with a greater emphasis on the individual student's ability to accept, process, and learn the necessary information. Further, students' aptitudes, skills, and mental capabilities would be matched to a suitable occupational specialty to ensure their education optimizes their contributions to the health and well-being of our military personnel. This article provides excellent insight, not only into where we should be going, but also where we are, in that all the ideas are based on present technical and educational initiatives and trends. A good read which should encourage all military medical professionals to obtain and read *The AMEDD Futures 2039 Project: Phase 2 Final Report*.

An excellent example of the rapid advances in the capability and sophistication of technology in medical education is the expanding use of human patient simulation in many venues. Dr Don Johnson and his coauthors compared the efficacy of the simulation against self-paced instruction using a CD-ROM based syllabus in a very

specific circumstance—management of patients exposed to chemical agents. During their preparatory search of the extensive literature on simulation use in medical education, they found no rigorously designed studies that had made such comparisons. Therefore, their study is apparently the first to apply scientific rigor in the collection of data on which to base comparative conclusions. Their article presents a detailed description of the carefully designed and executed study which used Army and Air Force nurses as the sample population to investigate teaching this specialized element of trauma care. Absent a major accident or natural disaster involving release of chemical agents, the occurrence of patients with such injuries is rare, so healthcare providers have been largely limited to printed and computer-based courses and exercises to obtain their expertise in this area. Effective simulation provides the interactive environment with the benefit of actual feedback to the actions of the student. Intuitively it would seem obvious that the student obtains the greater benefit from the simulation scenario. However, the considerable expense of purchasing and maintaining the simulators dictate that their value must be justified by performance data. The study by Dr Johnson et al is an important component in planning the future course of the education of healthcare professionals.

In an effort to ensure healthcare providers experience the most effective training possible in preparation for combat deployment, in 2001 the Department of Defense initiated the establishment of several joint trauma training programs in existing civilian trauma centers. The centers are located in areas with a high occurrence of combat-like

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trauma injuries, thus allowing military medical providers exposure to such actual injuries prior to deployment into the combat environment. On the surface, the program would seem to be an excellent idea, but do actual experiences of participants support the commitment of time and resources? Dr Carl Schulman and his team at the Army Trauma Training Center in Miami, Florida, conducted a scientific survey of participants following their return from combat deployments to gather their opinions as to the value of the training, and suggestions on improving the training experience. The survey sample represented over 2 years of training participants. The excellent article contributed by Dr Schulman et al provides an overview of the joint training effort, and presents the results of their study. Again, validation of a concept is a valuable contribution to planning for the future commitment of resources to our medical training efforts.

Army medical professionals have never hesitated to aggressively pursue solutions to better protect the health of our military. The safety of food and water is a paramount concern to commanders as their units deploy and operate in areas that usually have no capabilities or resources in that regard. Army Veterinary Service operates 4 food testing laboratories worldwide, but the delays between sample submissions from the field and receipt of results can delay necessary local actions in support of combat operations. To mitigate this problem, AMEDD developed and fielded 2 laboratory veterinary equipment sets designed to allow food and water testing capabilities to be located in close proximity to operating units. Staci Mitchell and her coauthors have contributed an article describing the process by which the AMEDDC&S Department of Veterinary Science identified the training requirements for the new equipment, designated the specialties who required training, designed and constructed the training syllabi, and implemented the training. The resulting fielding of equipment with trained operators has quickly placed testing capabilities in all major theaters of operations, markedly improving the health and safety of our deployed Warfighters. This article is an excellent example of how those responsible to create and provide training react quickly and effectively in response to a critical need.

We are pleased that this issue of the *AMEDD Journal* includes the report of a recent, major Air Force study to investigate the learning process, identify the components of how we learn and the factors affecting that process, and relate that information into the world of today, particularly from the military perspective in the design and delivery of training and education. The study was conducted by the Air Force Research Institute of the Air University. The resulting report, published in November 2009, is a collection of invaluable information for those responsible for any aspect of planning, courseware devel-

opment and design, training delivery, and evaluation of training effectiveness.

One approach to developing specialized skills which will be used in a team environment is called problem-based learning (PBL). Students are presented with a problem which they explore while working in groups. From a medical education perspective, this approach mirrors the course of patient care which is performed in a clinical setting. The triservice physician assistant program at Fort Sam Houston is restructuring its curriculum, and implementation of PBL for portions of the course is planned. The various elements to create a PBL program are complex and challenging. MAJ George Midla and Dr Joellen Coryell investigated one of those components, the preparation requirements for instructors in a physician assistant program which uses PBL. They identified universities that used PBL in physician assistant education, and interviewed experienced instructors in the programs. The interviews followed standardized formats with open-ended questions, and responses were transcribed and analyzed to develop categories and identify recurrent themes. Following a rigorous process, MAJ Midla and Dr Coryell extracted extensive information about the instructor/facilitator experiences which are unique to the PBL approach, the important differences in preparation and attitude from the standard classroom structure, the opinions of those experienced instructors as to the value of PBL, and many other factors to be considered in the selection and preparation of staff personnel. Their study results should be an important consideration in courseware design and staff planning for the restructured physician assistant curriculum.

As our understanding of the learning process has evolved, it has become clear that the static model of rote memorization and recitation of arcane facts is of little value in the development of an educated person. The concept of critical thinking has become prominent as one of the most important factors in effective learning—in its simplest terms, the idea of interpretation, analysis, evaluation, and application of information. This capability is extremely important for many professions, but none more so than healthcare. Further, since the education process depends on the quality and capabilities of the faculty, it is obvious that their critical thinking skills are very important as they must develop those skills among their students. In her extensive, detailed study, Dr Carol Hobaugh explored the critical thinking skills among the instructors of the AMEDDC&S Academy of Health Sciences. Her project examined the sample population with regard to a number of factors, including rank, level of education, occupational specialty, military experience, and others. Her article describes the complexities involved in a study of this extent, presents the design and

process of this project, and details the results after careful data reduction and analysis. Her results offer some surprises, answer questions, and generate more opportunities for inquiry into the factors supporting and detracting from the development of critical thinking skills among military professionals. Dr Hobaugh's study is a textbook example of classic scientific inquiry, and the results should stimulate further interest in this very important aspect of the learning process.

The next 2 articles continue the discussion of the changing nature of teaching and the learning process. In the first article, Stephanie Hamilton challenges the traditional method of information presentation, memorization, and summary examinations as markedly inferior to a multiple assessment protocol. Known as assessment-based instruction, students are evaluated throughout the course with multiple types of assessment tools to determine the level of cognitive understanding of material. Over the last 2 decades, this technique has demonstrated that it makes students active participants in the learning process rather than audience members, generates a collaborative learning environment, and allows students to more directly relate the course to real-world applications. It also generates measurable improvements in retention and proficiency. Such results are perfectly suited for the requirements of military training. Assessment-based instruction is the future, and should be strongly considered for incorporation into the curriculum of military medical education.

Dr Carita DeVilbiss and her coauthors investigated student failures in one of the enlisted medical training programs from a different perspective: they asked the students. Their team designed a research project to identify potential reasons why students fail (or succeed) using questionnaires and interviews, exploring several aspects of the learning environment (ie, class size, teaching methods, support systems) in addition to the individual participant characteristics, backgrounds, and experience. They also asked the students' battle buddies or close friends (with the student's permission) to complete questionnaires related to their assessment of the student. After examining the data, Dr DeVilbiss et al conclude that the majority of student responses are truthful, so the results should be valid indicators of what may be wrong, and right, in areas of the training program. Their article presents the data and the researchers' interpretations, and offers a list of recommendations based on the results. This study should be closely examined by curriculum planners and courseware developers for indicators as to how to improve the success rate in our military training programs.

To this point, the articles in this issue of the *AMEDD Journal* have dealt with the process of education—the

tools used, current methodologies, and research focused on how people learn, and how to teach. The last 2 articles deal with broadening the scope of education for military medical professionals beyond that necessary for their primary healthcare responsibilities. As with virtually every military career path, those in military medicine often take Soldiers from their primary occupational fields into (usually) related, albeit unfamiliar responsibilities. The learning curve may be difficult, and the individual's effectiveness may suffer for an extended period. There are also assignments for which a targeted educational preparation should be required, because the responsibilities may be situational, depending on shifting, external circumstances beyond the direct control of the military. In his article, LTC Thomas Bundt describes one such environment in which lack of background and understanding of under-lying factors seriously hamper efforts to develop and apply strategic healthcare policies in Iraq. He describes a number of situations for which the lack of understanding of historical, cultural, political, and religious factors seriously hampered efforts by US planners and policy-makers to assist Iraqis with their national health-care policy development. Unfortunately, some of these problems were generated by nonmilitary US government agencies with major roles in the development of Iraq's infrastructure, but LTC Bundt points out that military staff members must be in a position to deflect such uninformed, counterproductive actions. Such intervention must come from a sound position of knowledge and confidence. Sources for such training should be identified for the military as a whole, because the critical gaps in knowledge are not limited to medical issues and policy development.

MAJ Jon Baker and MAJ Jason Sepanic close this issue of the *AMEDD Journal* with a thought-provoking article describing a resource for higher level, professional military education that they contend is notably underutilized by the AMEDD, to the detriment of AMEDD representation on high-level staffs throughout the military command structure. The Army's School for Advanced Military Studies (SAMS) provides an intense curriculum on the complex operational problems of warfare, and provides the knowledge and insight to address them. The authors point out that AMEDD officers may be at a disadvantage when serving in high-level staff positions because they might not share the same background perspectives as their non-AMEDD contemporaries. Consequently, medically related policy matters and decisions may be developed without equivalent level participation from the medical staff representative. AMEDD officer personnel managers should examine this situation with a view towards broadening the eligibility for attending SAMS, and actively encourage AMEDD officers to apply.

How Science and Technology Will Enhance Medical Education and Training by the Year 2039

COL Randall G. Anderson, MS, USA

In the fall of 2008, the Army Medical Department (AMEDD) began work with the Institute for Alternative Futures* on an initiative to develop leaders with a capacity for futures thinking and to examine major trends that may impact the AMEDD. Bringing together a large group of subject matter experts from across the command, this project, titled “AMEDD Futures 2039,” was designed to envision the operating environment 30 years in the future.¹ An important element of this forecasting included looking at advances that may impact how we train and educate our medical personnel.

After examining current trends in healthcare and the military, it appears likely that new advances in medical science and educational technology will continue to drive the evolution of the techniques and products used to prepare personnel for their medical missions. Two primary themes stand out in this area:

- personalized medical education and training for each individual;
- a continuum of life-long medical education that begins before arriving at the school and continues throughout the service member’s career.

In the broadest definition of terms, “education” is the process of gaining knowledge, while “training” is the process of learning a skill. We can expect the military to continue to focus on the importance of essential medical skills built upon a strong scientific base of knowledge. By 2039, the preponderance of medical education will be tailored to the individual learner and less structured to a core curriculum delivered uniformly to classrooms of students. Students will be trained to learn through mental skill development. Interaction between written instruction, hands-on

practical training, and proficiency testing will become virtually seamless, enhanced by adaptive products that sense and respond to individual aptitudes (strengths) for learning.

Avatars tailored to an individual’s specific learning style will assist them beyond the initial training and provide a continuum of education throughout their career. New information on medical issues and emerging scientific discoveries will be integrated real-time to the teaching products, removing the delay experienced by cycle times to develop and update curriculum and textbooks. Based on these basic assumptions, the following forecasts for medical education and training appear viable between now and 2039.

ACADEMIC TRAINING ENVIRONMENT

The future academic institution is less focused on general (core) curriculum delivered in a standardized, physical classroom. Instead, military personnel benefit from tailored instruction, delivered in the style that is optimal for each student. Data-rich educational records for new service members will better match their aptitude, skills, and mental capacity to their occupational specialty and selection for advanced training. Before any medical instruction begins, students are trained on mental skill development to enhance their reading comprehension, critical thinking strategies, and time management skills.² Through brain-computer interfaces using dynamic, learning biofeedback, resilience is instilled to achieve maximum results in courses. Competency-based, patient outcome-oriented skills evaluation will replace the preponderance of written examinations that are limited in value to test only the retention of facts. This

* The Institute for Alternative Futures is a nonprofit research and educational organization founded in 1977, located at 100 North Pitt Street, Suite 235, Alexandria, Virginia. It works with clients to create forecasts, scenarios, goals and strategies that are the essential tools for transforming organizations to succeed in times of rapid change. Information available at: <http://www.altfutures.com/>.

evaluation of skills is accomplished through motion tracking, sensor data capture, and built-in sensing systems that provide unbiased error-tracking and feedback assessments for all students.³

Many of the courses are taught through a virtual campus, providing a seamless continuity of training and counseling by a mix of human and computer academic instructors and advisors. With access to a constantly evolving knowledge base, educators and researchers will have a better understanding of the third- and fourth-order effects of the medical techniques taught and the effectiveness of their outcomes.⁴ Linkage between the large medical centers and the classroom through synchronous learning modality provides students with real-time case reviews and the ability to train as staff of a hospital while still in school.

Much of the curriculum and programs of instruction are created and maintained through hybrid-wikis. This tool for subject matter expert collaboration allows medical professionals around the globe, even those on the battlefield, to assist in shaping the instruction with the latest lessons learned.⁵ The hybrid form of the wiki* retains limited access, permission-based editing, and is moderated by school faculty.

CAREER-LONG AVATAR ASSISTED LEARNING

To assist service members in their continuum of education and training, a personalized avatar is assigned to them when they first join the military. This avatar guides the new recruit to prepare for the next level of training as they progress through their basic training and advanced studies. The education avatar learns the cognitive traits of the individual and uses the military's extensive training databases to continuously review and evaluate previously learned skills and critical knowledge sets. True benefits are realized as medical professionals arrive for specialized training and education. The personal education avatar assesses each new medical course for which an individual is scheduled, and systematically sequences previously unlearned lessons for maximized precourse development.

Once the medical professional leaves the school, the education avatar remains engaged with them

throughout their career, updating them on new medical findings and ensuring they are aware of the latest information appropriate to their profession. The career-long avatar has the ability of contacting its "owner" through all electronic means of communication when medical emergencies occur (ie, a pandemic outbreak) and advises them on appropriate actions.

ENHANCED LEARNING DEVICES

Development will enable a personal learning device to serve as a single "textbook" for all courses, able to wirelessly download text, audio, video, and reference materials for the most updated curriculum and instruction.⁶ The dynamic curriculum will enhance the military applicability of the education by making battlefield lessons-learned readily available to those training for war.

All new medical equipment and techniques are designed and integrated to require minimal training. Standardization of common components in all equipment reduces the amount of time and effort required to adapt new tools. Medical instruction will be augmented with animated, digital holograms, providing 3-dimensional diagrams of the entire human anatomy. Interactive holograms will allow realistic visualization of the anatomy under study, with the ability to manipulate the parts for a better understanding, often unavailable with static training models.⁷

Some learning is accomplished through devices that affect cultured neural networks. This interface between computers and the brain is made possible by advances in biocompatible materials, noninvasive sensory leads to the brain, and computational technology that relays data to enhance the learning capability of students. Students will gain medical knowledge through this brain-computer connectivity, often outside of the classroom and through portable, personal devices that provide education reinforcement of highly complex medical subjects.⁸

MEDICAL SIMULATION IN THE "CLASSROOM"

Advances in simulation will continue to enhance the environment for learning in the classroom. More responsive, situational-aware models will improve the

* A wiki is a web site that allows visitors to make changes, contributions, or corrections. Source: *Merriam-Webster's Collegiate Dictionary*. 12th Edition. Springfield, MA: Merriam-Webster, Inc; 2008.

realism of the increased human-computer interaction resulting in more effective training and reduced mental barriers to that experienced working with programmed machines.⁹ New advances in simulated tissues and multitexture human systems will allow realistic training in near-live tissue training. Human and animal mannequins not only replicate flesh-like tissues, but also fluids, sounds, and smells of real patients, incorporating greatly enhanced feedback sensors that respond to treatment and communication from the provider.

To add to the realism of the education, most classroom equipment and instructional methods are greatly adaptive to changes in the curriculum and interoperable with multiple scenarios of training. The physical layout of the “classrooms” morphs, through multisensory projection, to the desired environment that matches the simulated location.¹⁰ Virtual walls and virtual medical attendants in the classroom respond to sensors to assist in the education process and add realism. Telementoring and online classroom projection makes the virtual classroom available to anyone world-wide, even deployed personnel undergoing skills training in a combat zone.¹¹

EMPOWERMENT OF ALL SERVICE MEMBERS, CIVILIANS, AND FAMILY MEMBERS TO HAVE A ROLE IN MEDICAL EDUCATION

The military has long recognized the benefits of the promotion of disease prevention instead of treatment. Emerging technologies will allow the empowerment of all individuals involved in the military mission, including civilians and family members, to maintain their individual health network. A focus on prevention, with the most current recommendations, is tailored to the personal style of each individual, emphasizing their most effective behavior modification characteristics to achieve optimum health. This adaptation of truly personalized health education will accelerate the reduction of many preventable diseases and increase the medical readiness of the military forces.

Through integrated medical databases and personal avatars, each person will enjoy personalized health advice with the sound backing of the most recent medical science. Health interaction “kiosks” provide remote health professional and computer-assisted testing, diagnosis, and advice.¹² The empowerment of all personnel is achieved when the kiosk becomes a

dynamic, learning platform that provides relevant, sound medical education targeted at promotion of disease prevention.

ALTERNATIVE FORECAST

Futurists must also examine the possibility that the future they envision may not come to fruition based on certain predictable and unpredictable conditions. These are called alternative forecasts. An alternative forecast for medical education and training in 2039 may include hampered synchronization of efforts required to bring the virtual classroom to its maximum capacity due to budget constraints and conflicting priorities.¹³ Academic resistance to collaborative development of curriculum could continue to propagate outdated instruction, lacking the advantages of lessons learned from daily practice.¹⁴ Without proper consideration of ethical and legal implications of new science and technology introduced in medical training, medical professionals could find themselves in the middle of controversial practices and suffer a regression in accepted advances in this area. Without the focus on tailored medical education to the individual learner and the establishment of mental skill development training, AMEDD personnel may experience course attrition from essential medical specialties and experience delays through reclassification processes at greater rates than experienced today.

RECOMMENDATIONS FOR THE ARMY MEDICAL DEPARTMENT

What can we do to help shape the outcomes of the future? Analysis of the forecasts presented in AMEDD Futures 2039 provides 5 recommendations for the enterprise. They include:

1. Continue to support ongoing education research into outcomes and competency-based training. Embrace international collaboration, effective scientific exchanges with academia, and focusing education research on advancing outcome-based training. Ensure civilian and military academia research efforts are coordinated to gain the best results.
2. Focus efforts and resources on technologies that meet the strategic goal of clearly superior trained individuals, following a well-coordinated roadmap to ensure that funded projects support the overall objective and are not duplicative.

Some funding will be required to support bridging technology to reach this future education and training capability.

3. Increase the information technology training and development for all medical professionals, including those that develop curriculum and provide instruction in the classroom. Posture the AMEDD training environment to be a developer (and leader within academia) of new technologies and techniques to enhance education throughout the continuum of learning.
4. Consider ethical and legal implications and cascading effects of all new science and technology introduced in the training and education of medical professionals. Make sure there are clearly understood processes to review their impact.
5. Increase public relation campaigns to articulate the AMEDD's achievements in advanced technologies and research and development to recruit higher quality medical academic personnel. Continuously evaluate the requirement for new subject matter expertise, especially in areas such as genomics, molecular imagery, nanotechnology, and medical simulation robotics.

CONCLUSION

In 1919, Lincoln Steffens stated "I have seen the future, and it works."¹⁵ While none of us can truly "see" the future, we can use all tools available to forecast the environment we expect and establish a framework to achieve the best future possible. By synchronizing our efforts to achieve this strategic plan, we can maximize resources by reducing redundancies and waste. By embracing the benefits of science and technology, we can overcome barriers to change. *The AMEDD Futures 2039 Report*¹⁶ can serve as the launching point for this framework to enhance medical education and training. Then, leaders at all levels must realize their mission to develop skills as futurists to facilitate a positive change environment.

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Effects of Using Human Patient Simulator Versus a CD-ROM on Learning the Management of Patients Exposed to Chemical Agents

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ABSTRACT

Introduction: Very little prospective, randomized, experimental research exists on the use of simulation as a teaching method, and no studies have compared the effects of 2 strategies of using the Human Patient Simulator (HPS) and a CD-ROM on the management of patients exposed to chemical agents.

Methods: A prospective, pretest-posttest experimental, mixed design (within and between) was used to determine if there were statistically significant differences between educational strategies using HPS, CD-ROM, and a control group in the care of patients exposed to chemical agents. Care was operationally defined as the score on the Management of Chemical Warfare Patients Performance (MCWPP) instrument. Participants included active duty and reserve military nurses ($n=92$). They were randomly assigned to one of 3 teaching groups: HPS ($n=30$), CD-ROM ($n=31$), or a control group ($n=31$).

Results: Analysis of variance and a Tukey post-hoc test were used to analyze the data. The means on MCWPP instrument were as follows: HPS (pretest: mean=65.13, $SD\pm 8.9$; posttest mean=73.0, $SD\pm 8.6$); CD-ROM (pretest: mean=67.74, $SD\pm 11.18$, posttest mean=65.67, $SD\pm 10.82$); control (pretest: mean=68.51 $SD\pm 8.5$; posttest mean=62.6, $SD\pm 8.6$). There were no significant differences between the groups on the pretest ($P=.363$), but there were significant differences on the posttest ($P=.001$). Post-hoc analyses indicated the HPS group performed better than the CD-ROM group ($P=.017$) and the control group ($P=.000$). There was no significant difference between the CD-ROM and control groups ($P=.485$).

Conclusion: Based on the results of this study, the HPS is more effective than the CD-ROM in teaching nurses about the care of patients exposed to chemical agents.

INTRODUCTION

Never has chemical warfare presented such a real threat as it does today. The threat of terrorism is that an attack can happen anytime, anywhere in both civilian and military sectors. In situations where individuals are exposed to chemical warfare such as in combat or terrorist attacks, nurses may be the first or the only responders. Nurses, particularly those in the military, may have to extend beyond their usual scope of practice in providing care to individuals exposed to chemical warfare. Because war and terrorism continue to be constant threats to the United States, former President Bush's address to the nation after September 11, 2001, is still very timely, "I have a message to the military—

be ready!" Readiness for all military nurses consists not only of a thorough knowledge base, but the ability to assess, intervene, and evaluate care given to patients exposed to chemical agents. Military nurses are challenged as never before to have these skills. There have been no studies that have investigated the most effective method of teaching skills necessary for the care of patients exposed to chemical agents.

PURPOSE AND RESEARCH QUESTION

The purpose of this study was to evaluate whether the Human Patient Simulator (HPS) (METI, Sarasota, Florida) or an interactive CD-ROM was more effective in teaching the care of patients exposed to chemical

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warfare. Care was operationally defined as the score on the Management of Chemical Warfare Patients Performance (MCWPP) instrument and could range from 0 to 100 percentage points. The research question that guided the study:

Is there a statistically significant difference in educational strategies using HPS versus CD-ROM, and a control group relative to scores on the MCWPP instrument?

BACKGROUND

Simulation is defined as a realistic representation (model) of the dynamics or processes with which the participant interacts with the environment, applies previously learned knowledge into the decision making process, and responds with definitive decisions and actions to deal with a problem or situation. Simulation as a teaching method allows an interactive experience to reflect or parallel patient scenarios.¹ Performance feedback can be provided without concern regarding real-life consequences.² Simulation is a method of translating didactic knowledge into a safe learning environment. Further, Jeffries et al³ emphasize that simulation is a teaching strategy that can be used to facilitate connections between and among concepts through a process that actively engages students in learning. Such a strategy facilitates learning skills and knowledge.

The development of competency-based approach to education of healthcare professions has moved the focus away from recall of facts or knowledge to more complex clinical activities such as data gathering, prioritization, implementation of care, and evaluation. Simulation as a teaching strategy can provide both educational opportunities to learn those skills and the ability to evaluate whether the learner has acquired those skills. Maran and Glavin⁴ emphasize that the traditional systems of assessment such as multiple-choice examination questions cannot distinguish between clinicians with adequate versus inadequate skills or performance. Good⁵ emphasizes that simulation allows for real world experience that occur infrequently and can be used not only for effective education but for effective evaluation of the learner's ability to perform correctly.

Very little prospective, randomized, experimental research exists on the use of simulation as a teaching method, and no studies have compared the use of the

HPS and a CD-ROM relative to caring for patients exposed to chemical agents. However, a wealth of literature addresses the value of using simulation as a teaching method but fails to use a rigorous research design.⁶⁻¹⁰ For example, McIndoe¹¹ surveyed participants and found that the majority preferred problem-based simulation to lecture, rounds, or tutorial teaching formats, but he did not investigate the effectiveness of such an approach. Korndorffer et al¹² studied the development of performance-based laparoscopic suturing content using simulators and to test the effectiveness of the teaching strategy. They found that simulation showed a significant improvement in overall scores from baseline. However, they did not compare simulation to any other teaching method. Rauen¹³ found that simulation as a method of teaching allows learners to apply theory to practice in an integrated manner. Furthermore, she found that a simulator has the capacity to demonstrate more than a single event or parameter at a time, which allows participants to identify relationships essential and common to clinical practice. She found that the evaluation of the simulation sessions were universally positive. As a result of the use of simulation, students became confident and were able to demonstrate skills learned. However, Rauen did not compare the simulation approach to any other method or to a control group. Hall et al¹⁴ compared the success rate of endotracheal intubation among paramedic students trained on a human patient simulator group or on human subjects in the operating room. They found that human patient simulator training was as effective as students who were trained on human subjects. Steadman et al¹⁵ investigated whether full-scale simulation was superior to interactive problem-based learning for teaching medical students acute care assessment and management skills. They used a pretest-posttest design and determined that simulation-based learning was superior to problem-based learning for the acquisition of critical assessment and management skills. Wayne et al¹⁶ conducted a retrospective study of cardiac arrest team responses and compared them to a simulator trained group and a control group to determine if simulation improved the quality of advanced cardiac life support care provided. They found that simulator-trained residents showed significantly higher adherence to standards versus traditionally trained students. Gordon et al¹⁷ surveyed both students and educators about their opinions about simulation as a teaching tool. Both groups thought that the

advantage of using the stimulator outweighed the disadvantage of the cost of the simulator. Eaves and Flagg¹⁸ created a 10-bed simulated medical unit as part of a new graduate nurse orientation. The program received outstanding evaluations from the new graduates, the educators, and preceptors in the clinical setting where the new graduates practiced. However, the study did not compare the simulation with any other methods. Cioffi et al¹⁹ investigated the effectiveness of simulation on clinical decision making of midwifery students; however, the study used a posttest design with no mention of score reliability or instrument validity. Results showed that the students who received the simulation strategy collected more clinical information, had higher confidence levels, and reached a final decision more quickly than the lecture group. Dieckmann et al²⁰ introduced concepts into medical simulation that help to clarify potential problems during simulation and foster its goal-oriented use. Their introduction of these concepts allow for improved matching of simulation realism with desired outcomes. Johnson et al²¹ investigated the use of the HPS compared to a CD-ROM group in teaching care of patients exposed to chemical warfare agents relative to cognition and critical thinking. They found that there were no significant differences in lower-level cognition between the 2 approaches, but HPS was more effective relative to higher-level cognition and critical thinking. Bearnson and Wiker²² stress that there are limited rigorously designed pretest-posttest studies of simulation and a need exists for investigations that compare the simulation approach to other educational methods.

METHOD

The protocol was approved by the local military Institutional Review Committee. A prospective, pretest-posttest experimental, mixed design (within and between) was used to determine if there were statistically significant differences in HPS and CD-ROM educational strategies compared to a control group.

Setting

The study was conducted at the Air Force War Skills Simulation Laboratory located at the Wilford Hall Medical Center, Lackland Air Force Base, Texas. The laboratory is a fixed facility configured to represent a typical wartime medical care environment. For example, the walls were covered with camouflage netting and reinforced with sandbags. Bruce lights (field

lights) provided the lighting. Equipment included field gear used to transport equipment and supplies, and only the equipment that is available in a deployed environment such as a PT LOX (equipment used to produce field oxygen), field ventilator, Lifepak 12 Defibrillator/Monitor (Medtronic Inc, Minneapolis, MN), and a transport intravenous pump. A stereo system provided helicopter, artillery fire, and bomb blast sounds in the background. The centerpiece of the simulation laboratory was the HPS. Also, a room adjacent to the laboratory was equipped with video recording equipment and a monitoring system.

Sample

A convenience sample was used for this study which consisted of 103 active duty and reserve Air Force and Army nurses from south Texas. All had a minimum of a baccalaureate degree in nursing; five had master's degrees, and one had a PhD. The age ranged from 22 to 47 years. The rank was from 1st lieutenant to lieutenant colonel. The years of experience in the military ranged from 2 to 28 years (mean=10 years, SD±3.4). Fifteen had been deployed to Iraq, and the remainder expected to be deployed within the next year. Potential participants were informed of the purpose of the study and were assured that their participation was voluntary. They were also told that their performance would be videotaped to be used for evaluation purposes. All of the participants agreed to participate and signed a consent form. Eleven individuals elected to withdraw from the study, leaving a total of 92 participants, 51 female and 41 male, who completed all aspects of the study.

Content Development

The investigators reviewed the literature to develop the essential content to be taught in both the HPS and CD-ROM groups. The content was reviewed by an expert panel consisting of 2 certified critical care registered nurses, one emergency department nurse, 2 trauma physicians, and one chemical warfare educator. The content was revised until there was 100% agreement that the material presented for both approaches was the same, comprehensive, and accurate. To make sure that each individual received the same instruction in the HPS group, a script was used by the instructor for each session. To prevent an experimenter effect, the same instructor taught all participants in the HPS group.

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Process for All Groups

The participants were randomly assigned to one of 3 groups: HPS, CD-ROM, or control group. All of the participants completed the demographic data sheet, and each individual's performance was videotaped while caring for 3 simulated patients exposed to chemical agents. The HPS was programmed for 3 patient scenarios. The investigators used the MCWPP instrument for the evaluation for both the pretest and posttest. After their initial performances were videotaped, those participants in the HPS received instruction using the HPS as a teaching strategy, and those in the CD-ROM group used specially developed software covering the same content. Those in the control group received no instruction. One month after the pretest data were collected, the participants returned and had their performances videotaped for the posttest. At this time, the same scenarios were used, and the MCWPP instrument was used again for evaluation. So that individuals in the control group did not have the perception that they did not benefit for participation, they were able to select either the HPS or the CD-ROM for teaching after they completed both the pretests and posttests.

Numerous researchers have investigated the effects of simulation by evaluating the group's performance rather than the individual's performance. The disadvantage of such an approach is that some individuals may know the appropriate care and some individuals may not, but all receive the same score. To avoid this limitation, the investigators evaluated each participant individually for both the pretest and posttest.

Human Patient Simulator Group

The HPS consisted of a computerized, full-body mannequin that was capable of providing real-time physiological and pharmacological responses to various health condition and pharmacological interventions. The complete HPS system included the mannequin, computer software, monitors and gases required to operate the system. A cordless speaker located in the mannequin's head was used to simulate the "patient's voice." Participants were able to ask the mannequin questions, and the operator was able to respond by transmitting his voice through the mannequin. The operator was in an adjacent room, and observation was possible from a separate room through a closed circuit television monitor. Participants were

able to assess all physiologic parameters including normal and abnormal heart and lung sounds; to palpate pulses, check pupil response, and obtain vital signs; to monitor rhythms, pulse oximetry, blood pressure, and respiratory rates; and assess bowel sounds.

The HPS was used as a teaching strategy and was programmed with 3 patient scenarios: one exposed to a nerve agent with an abdominal wound and subsequent hypovolemic shock; one exposed to a nerve agent only; and one exposed to a mustard gas. The HPS was programmed to manifest signs and symptoms relative to nerve agent exposure that included pinpoint pupils, copious secretions from the nose and mouth, tearing, lung crackles, rhonchi, perspiration, hypotension, hyperactive bowel sounds, and pulse changes. Participants were able to obtain a manual blood pressure and palpate pulses. A HPS was attached to a cardiac monitor, the Life Pak 12, so that blood pressure, pulse, and cardiac rhythms could be assessed by observing the monitor. In the hypovolemic scenario, the monitor demonstrated that the patient had hypotension with tachycardia. In this scenario, radial and brachial pulses were absent but carotid pulses were present. HPS provided participants with the ability to assess, make a diagnosis, intervene, and evaluate the intervention. Appropriate physiological responses to pharmacological interventions such as administration of fluids or atropine were immediately demonstrated by the HPS. For example, in the hypovolemic model, fluid administration resulted in a decrease in pulse and an increase in blood pressure. After an adequate amount of fluid was administered, radial and brachial pulses were palpable. The administration of oxygen resulted in an increased saturation as monitored by pulse oximetry. The administration of atropine resulted in a reduction in secretions, crackles, rhonchi, perspiration, and increase in pupil size. The HPS allowed programming of 2 complex problems to be manifested simultaneously in the same patient scenario: exposure to chemical agent and hypovolemic shock. To prevent an experimenter effect, the same investigator served as an instructor and used the HPS as she guided the participant through each scenario.

Chemical Warfare CD-ROM

A chemical warfare CD-ROM was developed for this study that allowed participants to view PowerPoint slides that covered the pathophysiology of chemical agent exposure and hypovolemic shock. In addition, 3

scenarios were developed for the HPS. With each scenario, participants were able to assess each patient by clicking a selection of choices. The choices included assessment parameters such as vital signs, auscultation of the chest, and visual inspection of an abdominal wound as examples. After the choice was made, the CD-ROM provided the appropriate information that was queried. For example, if breath sounds were clicked, the participant would hear crackles and rhonchi. After collecting data, the participant made a diagnosis and intervened by clicking on a selection of choices. The participants were also able to click on various treatment options such as administration of oxygen, intravenous fluids, administration of atropine, and other treatment modalities needed to stabilize the patient. The participant could evaluate the treatment by clicking on assessment parameters such as vital signs, pulse oximetry, etc. After completion of each of the scenarios, the CD-ROM program provided feedback on each decision and evaluated each participant's performance. Each of the scenarios for both the HPS and CD-ROM groups took approximately 30 minutes to complete for a total of 90 minutes. The same expert panel as described above reviewed the CD-ROM to make sure the same content was presented as the HPS. There was a 100% agreement that the content was the same as the content developed for the HPS, accurate, and comprehensive.

MCWPP Instrument Development

The investigators reviewed the literature on chemical warfare to develop the criteria needed for evaluation of care given to the simulated patients. One hundred fifteen criteria were developed for the instrument. Each criterion was followed by a 1 or 0 (did or did not meet the criterion). The instrument was given to 6 experts in education and chemical warfare as described above. The experts individually rated each criterion as very relevant, relevant, not relevant, or not at all relevant. The items that all of the experts rated as either not relevant or not at all relevant were excluded from the instrument. The experts were also asked to include additional criteria that they believed to be relevant. The revised instrument had 105 criteria and was reevaluated individually by the same experts. The total number of agreements divided by the sum of agreements plus disagreements provided the percent agreement. The revised instrument had 98% agreement

relative to the comprehensiveness and the relevancy of the items.

Test-retest reliability was determined by evaluating 30 military nurses and reevaluating the same participants in 30 days. Pearson r was used to determine the correlation between the 2 sessions ($r=0.97$, $P<.01$) indicating that the instrument was stable over time. Using the MCWPP instrument, 3 investigators independently evaluated the performance of 3 participants who had been videotaped giving care to the simulated patients. The Pearson r was used to determine interrater reliability ($r=0.92$, $P=.01$). In a group session, the investigators discussed why they had or had not given credit for individual criterion until there was 100% consensus in evaluating the performance of the 3 participants. They evaluated an additional 3 subjects who had been videotaped. The interrater reliability was increased ($r=0.98$, $P=.01$).

An evaluation specialist was hired and educated in relation to evaluation of the participants. To maintain consistency, she evaluated all of the participants on both the pretests and posttests. Pearson r was used to determine the interrater reliability between the investigators and specialist ($r=0.98$, $P=.01$). Ten percent of the participants who were evaluated by the specialist were also evaluated independently by the investigators. The interrater reliability was maintained ($r=0.98$, $P=.01$). All of the investigators and the specialists were able to rewind the videotape if there were questions as to whether a participant did or did not meet a particular criterion. The specialists and investigators did not know to which group the participant was assigned, nor whether it was the pretest or posttest.

Power Analysis

The number of participants needed for this study was calculated by using an alpha of 0.05, moderate effect size of 0.5, and power of 80% which yielded 90 participants (30 in each group). The medium effect size was calculated from data from a pilot study implemented by the investigators.

RESULTS

An alpha of 0.05 was used for all analyses. Means and standard deviations (SD) were calculated for each group. The means on the MCWPP instrument were as follows:

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HPS: (pretest mean=65.13, SD±8.9; posttest mean=73.0, SD±8.6)

CD-ROM: (pretest mean=67.74, SD±11.18, posttest mean=65.67, SD±10.82)

Control: (pretest mean=68.51, SD±8.5; posttest mean=62.6, SD±8.6)

A repeated analysis of variance was used to analyze the data. There were no significant differences between the groups on the pretest ($P=.363$) indicating that the groups were equivalent. There were significant differences on the posttest ($P=.001$); therefore, a Tukey post-hoc analyses was used to determine where there were significant differences. The HPS group performed better than the CD-ROM group ($P=.017$) and the control group ($P=.000$). There was no significant difference between the CD-ROM and control groups ($P=.485$). The data are summarized in the Table.

COMMENT

Based on the results of this study, the choice of teaching strategies is the HPS as compared to the use of a CD-ROM.

Perhaps the reason is that the use of the HPS provides more of an opportunity for learners to apply principles, concepts, laws, and theory than other strategies. Specifically, the approach may foster critical thinking. May et al²³ summarize the definition of critical thinking from various authorities and conclude that it is a process, a composite of knowledge, attitudes and application of skills. They reasoned that such thinking involves the examination of ideas, inferences, assumptions, principles, arguments, conclusions, issues, and actions. Specifically, critical thinking is the ability to assess, diagnose, intervene, and evaluate accurately. These are the same processes inherit in clinical decision making.

The HPS allowed participants to use the cognitive skills of assessment, treatment, and evaluation in a realistic simulated environment. Specifically, in this study, participants were able to collect data relative to the signs and symptoms portrayed by the HPS, make a diagnosis, intervene, and evaluate the effectiveness of the treatment in a very realistic environment. This supports the findings of Cioffi and colleagues who found that simulation education increased clinical

decision making.^{19,24} The current findings also support the findings of Johnson et al²¹ who found that the use of HPS did not make a difference in increasing lower-level cognition, specifically knowledge and comprehension. This may be related to the fact that knowledge is a function of remembering facts, and comprehension is the ability to grasp the meaning of information. These levels of cognition represent the lowest level of learning outcomes. Johnson did find that the use of HPS compared to a CD-ROM made a statistically significant difference in outcome for higher-level cognition and critical thinking cognition as measured by a multiple-choice examination. We theorize that the higher-level cognition and critical thinking are prerequisites for effective performance as defined in the current study.

Summary of data results.						
	Mean Scores HPS Group	Mean Test Scores CD-ROM Group	Mean Test Scores Control Group	Post-Hoc Analyses		
Pretest	65.13 ± 8.9	67.74 ± 1.18	68.15 ± 8.50	HPS vs CD-ROM $P=.017^*$	HPS vs control $P=.000^*$	CD-ROM vs control $P=.485$
Posttest	73.00 ± 8.6	65.67 ± 0.82	62.60 ± 8.60			
*Mean difference is significant at the 0.05 level.						

The effectiveness of such a strategy stems from the theory of situated cognition, which states that individuals best learn “what to do” and “how to do” in a real world environment.²¹ Accordingly, situated cognition asserts that critical thinking and ability to perform has to occur within the context of the situation. Knowing what to do and how to do it are essential components of appropriate care of chemical warfare casualties. This concept has to be developed within specific subject matter and is best taught under realistic simulated conditions that best represents the desired patient care conditions.

SUMMARY

This was the first study that investigated the use of HPS compared to a CD-ROM in the performance abilities relative to management of care of patients exposed to chemical agents. The study used a pretest-posttest 3-group prospective, randomized design. The groups did not differ on the pretests scores indicating that the groups were equivalent. The posttest scores indicated a significant difference between the HPS and control groups and the HPS and CD-ROM groups, but there

was not a significant difference between the CD-ROM and control groups. Perhaps the reason the CD-ROM group was no more effective than the control group was that the approach was not as realistic as the HPS and provided choices for the participant to click. The HPS provided real world scenarios where participants could practice collecting relevant data, clustering the data, making a diagnosis, intervening, and evaluating the effectiveness of the approach without a list of options. Such an approach provided by the HPS provides the opportunity to develop higher level cognition and critical thinking that are necessary for the ability to perform and manage patient care. The disadvantage of using HPS is that it is expensive to purchase and maintain. The HPS was reliable, but on 2 occasions the investigators had to cancel participation until it was repaired. Also, the system requires at least 2 individuals: one to teach and one to operate the system.

Limitations of the study include the use of a convenience sample which may restrict the ability to generalize findings. Some participants worked the night shift before participating in the study and could be an external threat to validity in terms of fatigue. However, the same number of participants who worked the night shift before participation was in each group.

Recommendations for future research include using the same framework for different content and investigating the effects of simulation on performance with other scenarios and comparing HPS to traditional classroom presentations.

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Photo courtesy of the authors.

Training Forward Surgical Teams: Do Military-Civilian Collaborations Work?

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ABSTRACT

The US Army and the Ryder Trauma Center (Jackson Memorial Hospital, Miami, Florida) teamed up to provide a training environment (ie, the Army Trauma Training Center) in which forward surgical teams can attend to gain critical teamwork and trauma technical skills to prepare for deployment to Iraq or Afghanistan. The purpose of this study was to gather trainee reactions to the military-civilian collaboration provided at ATTC after deployment to Iraq or Afghanistan.

Methods: Survey respondents were 135 US Army personnel (an approximately 50% response rate) who participated in the ATTC 2-week team training program between January 2005 and June 2007. The survey asked questions pertaining to their experience in the resuscitation unit and patient contact at the trauma center.

Results: Over 90% of participants agreed or strongly agreed that training in the resuscitation area was beneficial. A majority of participants also agreed or strongly agreed that the patient contact experience was sufficient (78.5%), was a good learning opportunity (90%), and that the experience was a good opportunity to apply what they had learned in their classroom training (over 80%).

Areas of suggested improvement included the importance of clarifying roles between the ATTC trainees and the Ryder Trauma Center residents and interns. Trainees would have preferred an extension of the training as a whole, as they felt it was rushed in order to fit all training opportunities into the 2 weeks that they were in Miami. Finally, trainees noted the lack of injuries admitted to the trauma center which replicate injuries caused by blasts (ie, improvised explosive devices).

Conclusions: The results of our efforts indicate that military-civilian collaborations do in fact work and are beneficial to both military and civilian medical providers. The opportunity to perform as a team in their respective roles, to respond to a variety of actual trauma patients, and access to civilian medical providers were beneficial. As mentioned, such collaborations are not without limitations. The good news is that most of the identified limitations will be corrected to ensure trainees get the best possible experience possible.

INTRODUCTION

Military-civilian collaborations in healthcare have existed for decades. Each community relies on the other to gain information and experience that would otherwise not be obtainable on their own. The US Army and the Ryder Trauma Center (Jackson Memorial Hospital, Miami, FL) teamed up to provide a training environment (ie, the Army Trauma Training Center) in which forward surgical teams can attend to gain critical teamwork and trauma technical skills to prepare for deployment to Iraq or Afghanistan. This paper discusses trainees' reactions to the military-

civilian collaboration provided at the Army Trauma Training Center.

BACKGROUND

Warfighters on today's battlefield endure almost insurmountable threats. However, despite this, it is estimated that 90% of those injured on the battlefield survive their injuries.¹ Simulation-based training has often been the strategy chosen to train medical providers in both the civilian and military communities. After all, simulations offer a safe, nonconsequential, cost-effective environment in which

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to practice the application of one's knowledge and skills. However, simulation-based training can only take medical personnel so far.

A General Accounting Office (GAO) report published in 1998 shed light on the lack of military medical preparedness during the Gulf War (1991).² For example, at the time, only 2 of 16 surgeons stationed on one Navy ship had recent trauma experience. Furthermore, surgical support teams operating in the battlefield in fact had no actual surgeons on the team. This led to a number of initiatives to improve pre-deployment training for US Army medical personnel. These initiatives focused on providing surgical teams with not only classroom and simulation training, but also hands-on training with actual trauma patients.

The severity of injuries seen on today's battlefield is nothing like those previously encountered by these medical teams. Many of these injuries, resulting from improvised explosive devices, gunshot wounds, or other blunt and penetrating trauma, require immediate care and stabilization before Soldiers can be transported from the war zone. Therefore, forward surgical teams must be able to respond rapidly and effectively to save lives during the "golden hour." It is within these first 60 minutes after a trauma occurs that care is required to significantly improve a trauma victim's chance of survival.

To address the concern over a lack of preparedness, efforts stemming from the 1998 GAO report² focused on exposing military medical providers to combat-like injuries in civilian trauma centers. As a result, 7 joint trauma training centers were opened,³ including the US Army Trauma Training Center (ATTC). In existence since 2001, ATTCin is located within the Ryder Trauma Center at the University of Miami/Jackson Memorial Medical Center in Miami, Florida. The Ryder Trauma Center, a standalone, level 1 trauma facility, was chosen based on its close replication of the battlefield trauma system. The Ryder Trauma Center sees approximately 4,400 trauma cases each year. In addition, as a standalone trauma center, Ryder was chosen to minimize the "competition for action" between trainees and civilian staff employed by the trauma center (a concern at other hospitals where trauma cases are few and far between).

While previously unable to gain expertise on battlefield-type injuries prior to deployment, ATTC

offers a 2-week intensive team training program which combines classroom, simulation, and actual clinical experiences. The culmination of their training is a grueling, 24-hour exercise in which the forward surgical team essentially takes over the resuscitation unit at the Ryder Trauma Center. It is here that the knowledge and skills learned are put to the test; their last opportunity to apply what they know before being deployed.

Although initial reactions data is currently collected during the 2-week training course, also important is long-term reactions to the training program postdeployment. Therefore, the purpose of this effort was to gather trainee reactions to the military-civilian collaboration provided at ATTC after deployment to Iraq or Afghanistan. With this information, strengths of the program can be highlighted and improvements made in areas where necessary.

METHOD

Procedure

Surveys were conducted online. A link to the survey was distributed via email to all US Army forward surgical team personnel who attended training at ATTC between 2005 and 2007. The survey was developed using Key Survey (WorldApp, Braintree, MA) and asked questions pertaining to their experience in the resuscitation unit and patient contact at the trauma center. Questions were both quantitative (using a 5-point Likert rating scale) and qualitative, focused on trainees' reactions to the training.

Participants

Survey respondents were 135 US Army personnel (an approximately 50% response rate) who participated in the ATTC 2-week team training program between January 2005 and June 2007. Participants were a mix of surgeons (15.2%), nurses (registered nurses: 19%, nurse anesthetists: 10.5%, vocational nurses: 16.2%), operating room techs (15.2%), emergency medical transporters (12.4%), administrators (2.9%) and other (8.6%).

RESULTS

Quantitative Responses

Questions were broken down around two areas, reactions to experiences in the resuscitation unit

Table 1. Questions and responses related to experience in the resuscitation (Resus) unit.

Question	SA	A	N	D	SD
Cases that came into Ryder Trauma Center were applicable to the trauma curriculum.	53.7	41.8	3.7	0	0
I feel that the clinical training experience in Resus was a good opportunity to work in the role and function I perform/am assigned.	45.2	38.5	4.4	5.9	3.0
After a case in Resus, I was given feedback on my performance.	42.2	40.7	5.9	3.7	3.7
After a case in Resus, we discussed the scenario and actions taken within the team.	45.2	45.2	4.4	2.2	0.7
I had access to Ryder Trauma Center faculty/physicians to ask questions regarding a specific topic.	48.5	41.0	8.2	0.7	0.7
I would have liked to have had better access to Ryder Trauma Center faculty/physicians to ask questions and gain information.	18.7	18.7	32.8	22.4	5.2
I feel that we had a sufficient amount of time in Resus.	33.3	44.7	11.4	6.8	2.3
Training in Resus was beneficial.	51.5	41.8	3.7	1.5	0.7
I would have like to have spent more time in Resus.	34.8	21.5	28.1	13.3	1.5
Note: All response values are stated as percentages. Response Keys SA - strongly agree: A - agree: N - neutral: D - disagree: SD - strongly disagree					

(Resus) and reactions to amount of patient contact. Overall, the quantitative responses were extremely positive.

Resuscitation Experience. When asked about trainees' experience in the resuscitation unit of the Ryder Trauma Center, over 90% of participants agreed or strongly agreed that training in Resus was beneficial. A majority of participants also agreed or strongly agreed that the clinical experience gained in Resus was related to the trauma curriculum and were given feedback after a case. Finally, approximately 90% of respondents agreed that Ryder Trauma Center faculty/physicians were available to answer questions and less than 40% would have liked greater access to Ryder staff. Table 1 presents the response distribution.

Patient Contact Experience. The next set of questions focused on trainees' reactions to the patient contact experience during their 2-week training program. Similar to their resuscitation experience, a majority of trainees agreed or strongly agreed that the patient contact experience was sufficient (78.5%). In addition, almost 90% agreed or strongly agreed that the patient contact experience was a good learning opportunity, and over 80% felt that the experience was a good opportunity to apply what they had learned in their classroom training. Table 2 presents the response distribution.

Table 2. Questions and responses related to patient contact

Question	SA	A	N	D	SD
I believe I had sufficient patient contact hours at Ryder Trauma Center.	38.5	40.0	9.6	8.1	3.0
I feel that my patient contact hours were a good learning opportunity.	48.1	41.5	4.4	2.2	3.0
I feel that my patient contact hours were a good opportunity to apply what I had learned in the classroom setting.	43.7	40.0	11.1	2.2	2.2
Note: All response values are stated as percentages. Response Keys SA - strongly agree: A - agree: N - neutral: D - disagree: SD - strongly disagree					

Qualitative Responses

In addition to quantitative questions, survey respondents were also asked open-ended questions about their experience during the 24-hour capstone event, as well as what they thought could be improved. Overall, positive responses outweighed negative response with approximately 60% of respondents providing positive feedback. A number of trainees felt that overall the experience was excellent, especially for nurses and medics. Others commented that the opportunity to work as a team and be "in charge of the whole operation" was beneficial. Finally, one respondent stated "My team is 6 months into deployment and I am grateful that I got to ATTC prior to shipping." These comments and the other positive comments, such as those in Table 3, highlight the importance of the military-civilian collaboration when training forward surgical teams.

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Table 3. Sample of comments related to strengths of training program.

Having gone through 2 rotations, I still learn something new and would enjoy the chance to come back again.
All in all, I believe this was the very best medical training experience ever received.
It was scary but the presence of the Ryder staff gave me confidence to deal with my cases.
Physically and mentally demanding.
We saw a variety of patients.
Overall a good tool for assessing strengths and weakness of team members.

Table 4. Sample of comments related to areas in need of improvement.

More collaboration instead of collision with the interns and nursing staff.
More shifts even if you have to go to 3 weeks.
Good for nurses and medics, not so good for MDs.
More exposure to the operating room.
More time, more patients.
It would have been better closer to our deployment time.

Survey respondents were also asked to provide suggestions as to how the resuscitation experience could be improved. Table 4 contains a small sample of the comments. Areas of improvement revolved around 4 common themes. First, a number of respondents discussed the importance of clarifying roles between the ATTC trainees and the Ryder Trauma Center residents and interns. While fewer problems were identified with the permanent Ryder staff, there were several instances of military and civilian trainees competing for patient time. Second, some trainees commented that the number of patients admitted to Resus during their capstone experience was limited, as well as the time they were able to spend in the operating room. Next, trainees would have preferred an extension of the training as a whole, as they felt it was rushed in order to fit all training opportunities into the 2 weeks that they were in Miami. Finally, trainees noted the lack of injuries admitted to the trauma center which replicate injuries caused by blasts (ie, improvised explosive devices).

COMMENT

The military-civilian collaboration occurring between the US Army and the Ryder Trauma Center has been in existence since 2001. The purpose of this survey study was to determine reactions to this collaboration by forward surgical teams who attended the 2-week training program offered by ATTC. Overall, reactions are positive; the opportunity to perform as a team in their respective roles, to respond to a variety of actual trauma patients, and access to civilian medical providers were beneficial.

The ability to operate in such an environment, however, is not without its limitations. For example, it is not possible to predict the number of patients that will be admitted to the trauma center or the injuries which victims will present for treatment. While the injuries observed at Ryder Trauma Center may not be entirely representative of the injuries presented in Iraq and Afghanistan (for example, injuries resulting from improvised explosive devices do not frequently occur in the civilian environment), the forward surgical teams nonetheless are provided with the opportunity to operate as a team in “as close to the real” environment as possible.

The feedback received from trainees has also shed light on areas within the program in need of improvement, namely interactions between military and civilian (ie, residents and interns) trainees and the need for additional training. First, it is no surprise that residents and interns at Ryder Trauma Center are eager to have “face time” with trauma victims admitted to the center. Thankfully, the clarification of roles between residents and interns on-call and forward surgical team trainees is a simple fix that can be implemented within the program.

A larger effort is underway to address concerns over the availability of training time, as well as the desire to attend training closer to the time of deployment. Forward surgical teams attending ATTC typically deploy as an intact team within 6 months of training. Because the deployment of a team cannot specifically be predicted, and to minimize the amount of time that the teams are away from their families, ATTC is exploring the use of portable technologies (eg, iPod Touch (Apple Inc, Cupertino, CA)) to provide procedural animations/videos and other educational

materials to teams that can be viewed prior to deployment. The advantage of the use of such portable devices is that educational materials, serving as a refresher course, can be stored on the device and viewed at any time by trainees (eg, in transport, during downtime) and as often as one would like.

CONCLUSIONS

Military-civilian collaborations have existed for decades. The question posed by this research is do these collaborations work? The results of our efforts indicate that they do in fact work and are beneficial to both military and civilian medical providers. As mentioned, such collaborations are not without limitations. The good news is that most of the identified limitations will be corrected to ensure trainees get the best possible experience possible.

ACKNOWLEDGEMENTS

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An Army Forward Surgical Team at work in the Ryder Trauma Center during their predeployment training at the Army Trauma Training Center, Miami, Florida.

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Veterinary Surveillance Laboratories: Developing the Training Program

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ABSTRACT

The increased need and demand for onsite, frequent, rapid, and portable food and bottled water testing for indicators of microbiological and chemical agents led to the deployment of 2 laboratory veterinary equipment sets. A Surveillance Food Laboratory Program (SFLP) was developed to allow Veterinary Corps commanders to establish targeted testing programs to enhance food safety and wholesomeness, along with faster responses to food defense, suspected foodborne illness, and food/water risk assessment missions. To support the deployment of the veterinary equipment sets and the SFLP, 2 new functional courses were developed by the Department of Veterinary Science. The Surveillance Food Laboratory Technician Course teaches essential technical skills that include sample processing, assay methodologies, results review, and interpretation of results produced by these laboratories. The Surveillance Food Laboratory Manager Course, developed for designated managers of the laboratories and laboratory programs, teaches the skills critical to ensuring proper surveillance laboratory oversight, testing, evaluation of results, risk communication, and response to presumptive positive results produced by the laboratories. Together, the courses allowed for the successful deployment of the unique veterinary equipment sets, resulting in development of fully operational surveillance laboratories in support of food protection missions in every major theater of operations.

BACKGROUND

Veterinary Services has 2 accredited reference food testing laboratories; the Department of Defense (DoD) Veterinary Food Analysis and Diagnostic Laboratory (FADL) at Ft Sam Houston, Texas, and the Veterinary Laboratory Europe at Landstuhl, Germany.¹ The laboratories, complemented by regional surveillance laboratories in Korea and Hawaii, encompassed the food laboratory support to the field. Despite the exemplary performance of these laboratories, the delays between sample submissions to receipt of results due to time and distance factors can adversely impact local missions. Thus, immediate local command support has relied on the Veterinary Service food inspection subject matter expertise, thermometers, and organoleptic testing for the inspection of food and bottled water for wholesomeness, safety, and defense. Striving to overcome this technology gap, 2 new laboratory veterinary equipment sets were developed and fielded. Assay training methodologies, originally developed at the Veterinary Laboratory Europe, were exported to the Army Medical Department Center and School (AMEDDC&S) Department of Veterinary Science (DVS) as a Professional Postgraduate Short Course Program course in early 2007. This initial, basic one-week familiarization course was fully developed and expanded into 2 separate DVS functional courses. As a

result, “surveillance food laboratories” is the new term for the successful deployment of these training initiatives.

SURVEILLANCE FOOD LABORATORY VETERINARY EQUIPMENT SETS

To meet the need for increased rapid, portable, onsite testing of food and bottled water to complement current programs established by reference laboratories, 2 veterinary equipment sets (VES) were developed and fielded to test for indicators of microbiological and chemical agents:

- The Field Microbiology VES primarily incorporates capabilities for microbiology testing of food, water, and equipment surfaces for indicators of microorganisms. This VES also includes bioluminescent swab tests.
- The Food Testing VES incorporates additional food chemistry screening tests.

Together, these equipment sets provide the Veterinary Service commander the opportunity to maintain surveillance food laboratories at critical sites within the command and the ability to “scout” local sites/vendors for potential food safety and defense issues.

SURVEILLANCE FOOD LABORATORY PROGRAM DEVELOPMENT

To provide guidance to Veterinary Service commanders on the deployment and use of the laboratory veterinary equipment sets, the *Surveillance Food Laboratory Program Guide*² was developed by DVS in coordination with the FADL, and signed into implementation by the DoD Veterinary Service Activity. The purpose of developing surveillance laboratories within unit/district commands is to achieve multiple food safety and defense goals. While not all inclusive, these goals provide unit/district commanders and the military community they support with a greatly expanded and improved food safety program:

- Increased surveillance allows increased opportunities to identify potential problems before they are manifested and provide guidance to local commands in areas or situations where the military mission necessitates a direct response.
- Increased surveillance allows targeted testing of potentially hazardous food products of increased concern that are specific to a region or locality.

SURVEILLANCE FOOD LABORATORY PROGRAM TRAINING INITIATIVES

As an AMEDDC&S training department, the Department of Veterinary Science is responsible for training Soldiers and Department of the Army civilians on the proper use and follow-up actions necessary to deploy and operate the laboratory veterinary equipment sets to their full potential. This responsibility was met with the development of the 2 new functional courses, the Surveillance Food Laboratory Technician and Manager Courses, which are taught by designated DVS laboratory training personnel complemented with FADL subject matter experts. Additionally, DVS dispatches a Veterinary Training Assistance Team (VTAT) to conduct an offsite version of these courses at the unit's location when requested by the unit commander. However, successful completion of this training is only the first step. Certification as a Surveillance Food Laboratory Technician is a 2-part process; successful completion of the DVS functional course or targeted VTAT as determined by the Chief, DVS; and acceptable proficiency results as determined by the FADL Director. This certification must be renewed annually.

The Surveillance Food Laboratory Technician Course (321-F18), developed for Veterinary Food Inspection

Specialists (military occupational specialty 68R) and designated civilians, is an intensive, fast paced, 80-hour course; where students learn microbiological and chemistry indicator assay methodologies and procedures. The first week of the course is the "crawl/walk" phase, as students are walked through topics that include basic laboratory procedures, laboratory safety and HAZMAT requirements, laboratory environmental surveillance, testing methods, laboratory worksheets, laboratory equipment and supplies, and interpretation and significance of their testing results. Week two is the "walk/run" phase where students are required to individually perform a variety of tests on samples of 4 different commodities, properly document all phases of testing and results, and conduct an oral briefing to explain the significance of those results. There are quizzes, practical exercises, and preparation time allotted throughout. Students are required to maintain an overall academic average of 75%, as well as receive first-time "GOs" on all graded practical exercises, in order to receive an AMEDDC&S Certificate of Training. Demonstration of this Certificate of Training for the residence course, or a DVS issued training certificate for VTATs, is required for the Soldier to request proficiency testing samples from the FADL in pursuit of certification as a Surveillance Food Laboratory Technician

Recognizing the need to train Veterinary Food Inspection noncommissioned officers, Veterinary Corps Food Safety Officers (Area of Concentration 640A), Veterinary Corps Officers (Area of Concentration 64A), and designated civilians as managers of the laboratories and laboratory programs, the Surveillance Food Laboratory Manager Course (6G-F15/321-F17) was created. Commanders must have confidence that only actionable results are produced by the surveillance food laboratories, and the training in this course directly contributes to providing that confidence. Building on the food safety and defense expertise already in their military occupation skill set, students are quickly immersed in a fast-paced, one-week course (including nightly homework and morning quizzes) that teaches concepts and skills critical to the surveillance laboratory operation, including laboratory rollout plans, laboratory oversight, testing, documentation verification, evaluation of results, risk communication, response to presumptive positive results, and auditing surveillance laboratories. The week culminates in a 6-hour, graded, practical exercise consisting of testing stations of the key concepts as taught. As with the technician course, students must achieve an overall 75% and all GOs to

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receive an AMEDDC&S Certificate of Training as determined by the DVS Chief. In addition, each student receiving an overall average of 90% and all GOs will have passed the surveillance laboratory manager proficiency requirement, as determined by the FADL Director, and will receive the Surveillance Laboratory Manager certificate. This training by DVS and certification by the FADL will also be conducted offsite for Veterinary Service units as needed and requested.

THE RESULT

As a result of these aggressive training initiatives by DVS, complemented by the FADL, 100 technicians and 48 managers have been trained to date. In turn, they have established 5 fully functional surveillance laboratories, with several more in varying stages of development. Locations include all major theaters of operations; and the units include both TOE* and TDA† units, Active Army and Reserve Veterinary Service units. These surveillance laboratories have successfully supported destination monitoring, Department of the Army special events, food and water risk assessment, food safety objectives, and similar food protection missions worldwide.

THE FUTURE

Upgraded versions of the 2 veterinary equipment sets are being fielded, with an associated shift in the surveillance laboratory concept and purpose. The VES 913B (Surveillance Lab Basic), will incorporate the methodologies, equipment, and supplies currently taught; but will include additional capabilities, including basic animal disease surveillance. This additional capability is not designed to support a veterinary treatment facility, but rather the disease surveillance within a local animal population or area of concern within a theater of operations. The VES 914B (Surveillance Lab Augmentation) is the next level of testing capabilities, with the dual purpose of both food protection

and animal disease surveillance missions, with an emphasis on specialty and advanced assays. To train the VES 914B, an Advanced Veterinary Surveillance Laboratory Course for certified technicians and managers is under development for implementation during Fiscal Year 2011. This course will train the new methodologies, with an emphasis on the dual purpose laboratory mission. All the DVS laboratory courses will reflect this shift from the Surveillance Food to the dual use Veterinary Surveillance Laboratory.

CONCLUSION

The Department of Veterinary Science, in conjunction with the DoD Veterinary Food Analysis and Diagnostic Laboratory, continues to successfully meet the challenge of developing new training initiatives to fulfill the field requirement for onsite deployment of the laboratory veterinary equipment sets and establishment of local veterinary surveillance laboratories. The result has been the establishment of multiple surveillance laboratories supporting food protection missions worldwide.

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*Table of Organization and Equipment: Defines the structure and equipment for a military organization or unit.

†Table of Distribution and Allowances: Prescribes the organizational structure, personnel and equipment authorizations, and requirements of a military unit to perform a specific mission for which there is no appropriate table of organization and equipment.

Leveraging Affective Learning for Developing Future Airmen

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This article is a reprint of the research study report of the same title which was released in November 2009 by the Air Force Research Institute, Air University, Maxwell Air Force Base, Alabama.

The mission of Air Education and Training Command (AETC) is to empower our nation's Airmen to fly, fight, and win by "delivering unrivaled air, space, and cyberspace education and training." However, realizing this vision in today's highly interactive, information-saturated, and global environment is tougher than ever. Mission success requires knowledge-enabled Airmen who understand, appreciate, trust, and internalize the tactics, techniques, processes, and procedures necessary to succeed in any number of complex situations.

As leaders at all levels, our Airmen must be able to anticipate and appropriately respond to a complicated and fluid national security environment. Developing such Airmen will require stronger commitments to education and training on the part of the learner to the point where learning never stops. Fostering this highly favorable attitude toward learning is possible only if Air Force education and training programs address learners' goals, motivations, social interactions, and individual learning styles. This means the Air Force needs a stronger focus on affective learning during the instructional design (ID) process for education and training.

The ability to handle complex problems across a wide spectrum of missions is not acquired through traditional rote-learning practices that merely assess an individual's ability to memorize facts in the short term. Air Force learning processes must facilitate intuitive understanding and personal internalization of often conflicting concepts, applications, and decision-making models. Effective education and training methods must recognize the filters and perceptions individuals will employ to frame a solution to any number of problem sets. Relying solely on a cognitive learning approach for leadership development is quickly being eclipsed by a drive to understand and employ affective methods to enhance learning and internalize decision-making skills.¹

Recognizing the evolutionary changes in the information environment, AETC published a white paper entitled *On*

Learning: The Future of Air Force Education and Training,² which stipulates that successful education and training in today's complex environment require a new learning culture. This includes instant and unfettered access to information through knowledge management, nonstop learning opportunities to provide continuous learning, and the right information at the right time that leads into precision learning. However, in addition to flexible and timely access to information, an effective Air Force learning environment must also instill in every Airman a strong desire to learn continuously.

More than just the opportunity and means to learn, effective education and training also require engendering students' desire to improve continuously.³ This should be directed at improving abilities and knowledge to accomplish the mission more effectively. A large percentage of the academic failure rate in our nation's schools is not because of limited facilities or incompetent teachers. Rather, many students fall behind because they do not feel that learning is important to them.⁴ To ensure mission success, the Air Force must have education and training programs that consider not only cognitive goals, but also learners, attitudes, and motivations. This should be carried out through the use of expert ID and innovative technology applications that inspire students to put forth their best effort.

Because of the fast-changing, technology-driven environment in which we operate, a true warrior ethos must be dominated by a desire to learn.² This paper addresses the importance of instilling that desire through Air Force education and training, and it examines various ways that technology can help. The opening portions of this paper review general learning theory, including the cognitive and affective aspects of learning. The next section considers the impact of ID on cognitive and affective learning. Good ID is the primary means to engage the affective domain. The paper then considers how technology can facilitate cognitive and affective learning processes. Recent advances in technology

provide increased social networking and adaptive learning applications that cater to affective needs. The remaining sections discuss how to apply these concepts with regard to advanced technologies, leadership, and future research.

LEARNING DOMAINS

Learning can be viewed as both a product and a process. Standard definitions of learning from the educational psychology textbooks of 40 years ago generally defined learning as a “change in behavior as a result of experiences.”⁵ This behaviorist approach assessed learning as an outcome that resulted in some external behavioral activity; however, not all learning leads to overt behavior. Consequently, many theorists later refined the definition of learning to consider changes in the way people “understand, or experience, or conceptualize the world around them.”⁶ So learning is an increase in information, but it also involves interpreting and comprehending. Different learners filter information in different ways, based on perspective. Individuals then restructure information to create personal knowledge.⁶ In other words, learning is a multidomain process involving intellect, emotion, and physical skills. Further, these domains are connected, and the condition of one influences the others.

Historically, educators have recognized and accepted the notion of separate domains for addressing different types of learning objectives. Bloom⁷ and his group’s foundational effort established three categories or domains of educational objectives and identified them as cognitive, psychomotor, and affective. The theory and accompanying research for the cognitive (thinking) and psychomotor (physical) categories are fairly well defined and commonly accepted. The definition and theoretical framework of the affective category has been more problematic and difficult to establish. This lack of clarity exists because the affective domain concerns human cultural beliefs, behaviors, attitudes, motivations, feelings, perceptions, and emotions that are very fuzzy and lead to ill-defined characterizations. Each of the three domains requires specific considerations, based on the intended learning objectives.⁸

COGNITIVE DOMAIN

Processes involving the development of intellectual skills characterize the cognitive domain. According to Bloom,⁷ the cognitive domain is best described by six categories that typify successive levels of thought complexity. Knowledge, comprehension, application, analysis,

synthesis, and evaluation designate progressive stages ranging from recalling simple information to making judgments about the value of ideas or concepts. Collectively, the theoretical range of the cognitive domain connects the thought processes necessary to acquire, process, and interpret information. This linkage to information processing makes computers and associated information technology applicable, facilitating cognitive objectives.⁹

The most effective educational processes in the cognitive domain challenge and support the learner’s ability to grasp new information and concepts. They focus on knowledge, reasoning, and performance that underpin the categories in Bloom’s taxonomy.¹⁰ Assessment processes in the cognitive domain determine the level of understanding achieved and provide feedback on learning outcomes. Educators design lessons intended to maximize the transfer of information and provide valid learning-assessment tools. Most educational programs focus almost exclusively on these processes during ID.¹¹

PSYCHOMOTOR DOMAIN

The psychomotor domain involves physical movement, coordination, and the use of motor skills and is generally associated with training. Physical skills, developed through training or practice, are measured in terms of accuracy, speed, precision, distance, or technique. There are several taxonomies describing psychomotor skills, and each includes increasing levels of physical dexterity and ability to adapt new movements when necessary. This domain is considered well defined as the results from empirical research generally agree with theories concerning psychomotor learning.⁷ Pilot, vehicle driver, weapons operator, and maintainer training are examples of psychomotor instruction.

AFFECTIVE DOMAIN

Processes involving our needs and emotions characterize the affective domain. Affective filtering of life’s circumstances creates an individual’s disposition, enthusiasm, motivation, attitude, attention, value, and emotion regarding another individual, object, fact, concept, process, and/or belief. Sinclair¹² refers to *affect* as a term used to describe the feeling or emotional aspect of experience, associated with

- the motivation of behavior,
- the maintenance and enhancement of self-esteem in the educational setting,
- anxiety and achievement motivation,

- development of curiosity and a need to know and understand, and
- social motives, such as a need for praise, recognition, and attention.

Although affective learning is difficult to define, anyone who has taught for very long recognizes its crucial role. In any given lesson, some students seem driven to absorb new concepts and ideas while others seem disinterested. This situation can lead to the often-heard phrase “what is taught is not the same as what students learn.”¹³ This highlights the strong influence exerted by affective processes on cognitive learning. Though theoretically incomplete, empirical evidence suggests that the absence of affective internalization of a concept attenuates long-term learning.¹⁴ Restated more simply, students who have little desire or interest to learn will learn little. Unfortunately, due to the indistinct nature of the affective domain noted above, there is not a good theoretical model for predicting the precise impact of affect on learning. A systematic approach for detecting level of affect is needed to assist teachers as they try to motivate and involve their students.

Several schemas have been proposed to describe the processes of the affective domain. Krathwohl¹⁰ proposed the most widely cited taxonomy with five major categories describing levels of affect. These categories, listed below in order from lowest to highest affect, provide a rough framework to assess and compare:

1. Receiving—Passive attention to phenomena (eg, listens attentively, asks, sits erect, and identifies).
2. Responding—Active participation in and reaction to phenomena (eg, participates, discusses, and helps others).
3. Valuing—Attachment of worth to phenomena (eg, explains, proposes, shares, and differentiates).
4. Organizing—Construction of value system that compares and relates phenomena (eg, generalizes, integrates, and synthesizes).
5. Characterizing by value—Application of consistent value system to control characteristic behavior (eg, works independently).

This taxonomy and its full description provide enough detail to create learning objectives that address the affective domain. The following is an example of an affective learning objective used many years ago by the Air Force Academic Instructor School:

The objective of this lesson is for each student to respond positively to using reflective teaching techniques to improve teaching ability.

Forty years ago, educators placed nearly as much emphasis on affective objectives as they did on cognitive objectives.¹⁰ Since that time, the share of affective objectives in ID has slowly declined to the point that few schools today include affective objectives in their lessons.

A student’s affective state influences his or her learning predisposition, and educators should consider this when designing and developing education and training courses. Students use affect as a filter to assist them in developing attitudes about the course, the instructor, their peers, and the topic that in turn contributes to students’ overall success in the learning process.¹⁵ When it comes to mastering skills, it is essential for students to exercise cognitive processes, but effective cognitive retention is marginalized if the affective domain is ignored. If one feels threatened, sad, bored, stressed, or preoccupied, the learning process can break down.¹⁶ Instructional theories and design models focus on the cognitive and psychomotor domains. Research generally makes the obligatory mention of the affective domain, but in practice affect is largely ignored as an area of scientific study in the instructional-technology field.

There are numerous reasons proposed to explain why affective objectives are seldom included in the curriculum of most schools^{10,17}:

1. Affective results are long range and intangible.
2. People fear the perception of brainwashing (blurring of education and indoctrination).
3. Outcomes can be “faked.”
4. Assessment is subjective (self-reported observations).
5. Absence of behaviors is as important as presence.
6. Some persuasive communication methods cause uneasiness.
7. Definition and understanding of affect are imprecise.
8. People disagree about affective behavior outcomes.
9. Using computers to teach attitude seems Orwellian.
10. The goal is efficiency, so affect is easily excluded.

Each of these factors has contributed to the limited use of affective learning objectives. However, another factor that may have played a role was the growing influence of technology on education.¹⁸ During the past half century, technology has grown ever-more present in the educational process. Computers, networks, multimedia, the Internet, online communication, and all forms of digitized information are commonly termed educational technology (Ed Tech) when employed for learning. Ed Tech has revolutionized the educational environment, and few classrooms are without some level of Ed Tech in place.

IMPACT OF TECHNOLOGY

Technology has routinely influenced educational theories, and some models of thinking reference the human mind in terms similar to a computer.¹⁹ The senses are seen as input devices, memory as a database, and the brain as some type of microprocessor. This may be a useful construct when considering presentation and recall of information, but one of the drawbacks to this type of model is that it neglects many other human processes such as interest, attention, emotion, beliefs, and motivation. Consequently, the impact of these factors on learning, which are frequently referred to as affective qualities, has often been ignored.

Advances in Ed Tech generally mirror advances in the broader technological realm, which has been dominated by software and hardware focused on efficiently delivering and transferring information. Over the past 40 years, educators have focused on the efficiencies that technological advances afforded educational processes.⁴ Computer-based instruction, Internet access, electronic testing, distance-learning applications, television, and content-management systems allow educators to transfer information to students and assess that transfer on a grand scale.²⁰ The combined effect of these initiatives reduced the influence of human emotions on learning. Predominantly, educators ignored the student's need for connection and personal involvement, both of which are necessary for effective learning. This situation created a bias toward cognitive objectives, which has only lately begun to subside.¹⁶ Recent developments in technology may help restore some balance between information processing and human involvement.

Paradoxically, technology that in the past may have led to a bias in favor of cognitive objectives may now be used to foster and scaffold affective objectives.²¹ Improved networking technologies promise new mechanisms for social interaction, and advances in human/computer

interaction are on the threshold of allowing computers to recognize user affect and respond accordingly. The latest social and communication technologies have led to applications that promote collaboration and student interaction. Educators now recognize that social learning (collaboration) tools have the potential to create opportunities to meet both cognitive and affective learning objectives. These tools include discussion forums, blogs, wikis, virtual worlds, and personal Web pages. However, the key to employing technology to support affective objectives is proper ID, which blends Ed Tech into the learning process.

MEASURING AFFECT

Assessing progress in meeting affective learning goals requires more effort than evaluation for cognitive objectives. "Difficulty with measuring affective goals is cited in the literature as one of the major reasons for neglecting the affective domain in instructional design models."⁸ Perhaps the most important factor in this regard is the protracted period required to cultivate complex affective behaviors. Most instructional periods are relatively short. Influencing a learner's value system generally requires instruction over a prolonged period. In addition, some affective objectives such as attention usually require periodic reinforcement. Main⁸ points to advertising or public relations campaigns as examples that address lower-level affective objectives over an extended period.

There are several basic methods for assessing affect. Direct behavioral observation is considered the most reliable but may not be possible for a large number of students or for dispersed learning activity. The ability to discern the affective state of students is a vital skill for effective teaching. One-on-one conversations or an interview is another method available to query a learner's affective state. However, workload and personnel constraints frequently impede such time-intensive assessment methodologies.

Self-reporting is another means to determine a learner's affective state. Surveys or questionnaires are generally used to query attitude or other affective characteristics, but there can be problems with reliability. Some students may give the answers they believe more suitable rather than express their true emotional state or attitude. Another means to measure overall affective state is an implicit questionnaire designed to reveal affect without bias from the student.²² These instruments probe affective characteristics through a series of highly formatted, previously validated questions to register affect reliably.

Writing assignments are commonly used as a valid assessment of affect. Essays can provide evidence of a learner's attitude toward a particular subject. However, analyses of essays can be somewhat subjective and may require a rubric and trained evaluators.²²

INSTRUCTIONAL DESIGN PROCESS

So how do we bridge the gap and develop linkage between cognitive and affective instruction as we develop lifelong learners? The key is to use an integrated ID process that targets both the affective and cognitive domains. According to Smith and Ragan,²³ ID refers to the "systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation." Good ID produces effective lessons based on sound educational principles. To be effective, lessons must both engage the learner and provide instruction in a clear and an efficient manner.

Engaging learners requires instructional designers to focus on incorporating the affective domain along with the cognitive domain during the ID process. The problem resides with the prevalent tendency to use ID models centered on instruction for cognitive objectives.⁸ However, the more instructional designers know about both the cognitive and affective processes involved in learning, the more competent and confident they are with regard to designing effective learning.²⁴ Expert ID of affective objectives can lead to greater motivation on a particular lesson and to successful cognitive and affective outcomes.

According to Pierre and Oughton,¹¹ instructional designers should not limit efforts in the affective domain to just motivating students to learn. Rather, they should consider how to engage students in deeper learning through the use of affective learning with appropriate pedagogy and evaluation methods. ID needs to become more effects based by creating instruction that addresses teaching strategies and learning outcomes that span the various levels of Bloom's taxonomy. In effects-based design, the designer considers holistic effects and the interrelated and interdependent nature of the learning domains. Main⁸ stated that integrating the affective instructional component into, or alongside, the ID model or process ensures that domain objectives are covered in every lesson.

The ID process ensures that learning does not occur in a haphazard manner but is guided using a process with

specific, measurable outcomes. The responsibility of the instructional designer is to create an instructional experience which ensures that learners will achieve the desired learning outcomes. ID has the appearance of a linear system; however, it is best viewed as an interactive process in which sequencing and fine-tuning of objectives are possible. There are no prohibitions against incorporating affective events or making changes to instruction. Teachers can adapt instruction based on evaluations and flow changes back through the process. Using ID as a working template can create the right learning program or process and justify necessary resources.²⁵

The ID process considered for the purpose of this study is the Military Instructional System Development (ISD) Model.²⁶ Analysis, Design, Development, Implementation, and Evaluation—generically known as ADDIE—is widely accepted as an industry standard for ID of educational media.²⁷ The ADDIE model brings a generic, systematic approach based on foundations-of-learning principles and standard system theory to the ID process.²⁸ The ADDIE process provides a framework that instructional designers can use to optimize the effectiveness of instructional products and the efficiencies of creative processes.²⁹

Each phase of the ADDIE model is a decision-making process that needs to ensure the effectiveness of the instructional experience²³:

- **Analysis:** The instructional problem is clarified, the goals and objectives are established, and the learning environment and learner characteristics are identified.
- **Design:** The instructional strategies are designed, the media choices are made, and the objectives and tasks that will show student mastery are created.
- **Development:** Materials are produced according to the instructional process.
- **Implementation:** Instruction is tested using prototypes (with the targeted audience). Flaws are corrected or revised before the product goes into production, and learners and instructors are trained on product use. Flexibility is the key element during the implementation phase.
- **Evaluation:** Feedback is gathered to help determine instructional effectiveness. Many consider this the most important stage, and it should be an ongoing process.

AFFECTIVE OR MOTIVATIONAL DESIGN

Motivational design is a systematic process that results in the preparation of learning programs that predictably influence the learner's behavior. Consequently, motivational design is concerned with connecting instruction to learner goals, providing stimulation and appropriate levels of challenge, and influencing how learners will feel following success or failure of goal accomplishment. Every educator understands the challenge of stimulating and sustaining learner motivation and the difficulty of finding reliable and valid methods for motivating learners.

One approach to motivational design is provided by Keller's Attention, Relevance, Confidence, and Satisfaction (ARCS) model of motivation.³⁰⁻³³ The ARCS model is based on a synthesis of motivational concepts and characteristics that provide guidance for analyzing the motivational characteristics of a group of learners and then designing motivational strategies to fit the learners.³³ The four conditions that comprise ARCS must be met to motivate learners.

There are two major parts to the model. The first is a set of foundational factors representing the components of motivation, based on research into human motivation. The instructional designer should use them as guidelines during lesson-development activities:

- Attention strategy relates to stimulating and maintaining the learner's attention by initiating an instructional event with some sort of sensory stimuli and/or varying the kinds of activities or media.
- Relevance strategy communicates to the learner how the activity or event relates to personal needs, interests, or motives.
- Confidence strategy relates to the learner's expectancy to feel it is worth the effort to participate in the activity.
- Satisfaction strategy provides extrinsic and intrinsic reinforcement from the learning experience.

The second part of the ARCS model is a systematic design process that assists in creating motivational strategies appropriate for a given set of learners. The synthesis allows educators to identify the various elements of student motivation; the design process helps profile students' motivational characteristics in a given learning environment and then design appropriate motivational tactics.³² Keller further breaks down each ARCS strategy into three psychological concepts that

assist designers by providing a theoretical foundation for each component:

- Attention—perceptual arousal, inquiry arousal, and variability
- Relevance—goal orientation, motive matching, and familiarity
- Confidence—learning requirements, success opportunities, and personal control
- Satisfaction—intrinsic reinforcement, extrinsic rewards, and equity

COMBINED INSTRUCTIONAL AND MOTIVATION DESIGN

Keller never intended that the ARCS model stand apart as a separate system for ID; rather, it should be incorporated with instructional models.³⁴ Additionally, history and research have revealed that no one theoretical foundation for ID practices is suitable for all applications.³⁵ Both affective and cognitive ID approaches account for meaningful learning and realistic contexts for application knowledge and skills.³⁶ Both recognize the importance of learner motivation and prior experience.³⁷

Keller's ARCS model attempted to correct discrepancies that marginalized the efficacy of most educational theories.⁸ That is to say, while a learner may be motivated toward learning, there is no assurance that a person is motivated to learn what the instructional event delivers. Additionally, instructional designers cannot assume they understand student motivation. During analysis, designers must attempt to understand how best to encourage students to reach the same conclusions regarding the values, interests, motivation, and content intended by the lesson's learning objectives.³⁸ The goal should be a combined ID model that includes a structured process incorporating both cognitive and affective concerns. Main⁸ suggested integrating the ADDIE and ARCS models using a matrix to address the two domains in a systematic manner. Integrated ID (Figure 1) is an essential component for building an effective learning program.

The design process has become more complex as advanced communication technologies have made social networking, information retrieval, and knowledge management available 24/7 worldwide. To bridge the gap and engage students in deeper, meaningful learning, instructional designers need to incorporate the affective domain during the design process. They must also follow the fundamental principles that apply to all pedagogy, including the external conditions that support learning and performance.²⁴

A large number of instructional strategies and models are available for designers to help facilitate learner engagement and the learning process. It is important for instructional designers to have a solid understanding of the theory and the design process though they need not be subject-matter experts in a particular discipline. This paradox makes it important for instructional designers to keep sight of what Sugrue²⁴ calls the five fundamental learning and performance principles:

1. Learning is not performance: Align learning objectives with required performance objectives entwined with adequate incentives for applying the new skill and knowledge.
2. Medium is not the method: Design to maximize strengths of the medium, but don't expect the medium itself to influence content effectiveness.
3. External and internal conditions should match: Ensure that flexible instructional methods are compatible with the cognitive processes of acquisition, knowledge storage, and retrieval while motivating learners to engage in their own learning.
4. Authentic practice makes perfect: Design as contextually realistic as possible, matching goals of instruction for deepening knowledge.
5. One size does not fit all: Accommodate individual differences by monitoring performance; diagnosing weaknesses; and adjusting feedback, information, and practice activities to meet group and/or individual goals.

Instructional designers well grounded in affective and cognitive learning and motivation processes are better equipped to design effective learning products.

LEARNING WITH TECHNOLOGY

Ed Techs are evolving daily, and the use of advanced Ed Techs in the classroom is now the rule rather than the exception. Higher education in the United States has given priority to integrating technology into the curriculum. The primary benefits of technology integration include efficiency in accessing information, distribution and presentation of course materials, applications to calculate and record, flexibility to adapt to individual learning differences, and meeting real-world technological skill requirements. Even the simplest use of technology (eg, spreadsheets, presentations, word processing, downloading information) appeals to faculty and learners.

Today, advanced communication technologies have enabled instant delivery of massive amounts of information in a variety of formats and user-defined levels. Some posit that the instantaneous availability of massive amounts of unstructured data leads to problem-solving errors.³⁹ Others take the opposing view, suggesting that “digital natives” have adapted their learning skills to accommodate the technology⁴⁰ and have acquired a self-regulating ability to organize the data necessary to resolve decision-making conflicts.^{41,42} Further research is required on the subject, but advanced communication technologies are alluring to the educator because they provide the power to reach more students at a variety of learning levels.²¹ Additionally, such technologies afford a multisensory approach to gaining and maintaining student cognitive and affective interest as long as such approaches are based on sound pedagogical principles.¹⁸ The quandary facing researchers and faculty members alike is the question of whether or not advanced communication technologies actually improve learning.

The literature on the subject is varied, but a majority of people writing on Ed Tech have found that technology alone does not necessarily enhance the learning process over traditional methods.^{24,43} Rather, research has shown that technology can aid the learning process but only if applied correctly. Therefore, we can assert that although learning is not technology dependent, technology as an enabling tool has potential to improve the level of learning when properly applied.

One advantage of integrating technology into ID is its ability to present or provide access efficiently and effectively to a variety of information. However, it is imperative that educators shift the paradigm from where students learn from technology to where students use technology as a cognitive tool or learning enabler. The real power of Ed Tech comes not from automating information transmission but from enabling student

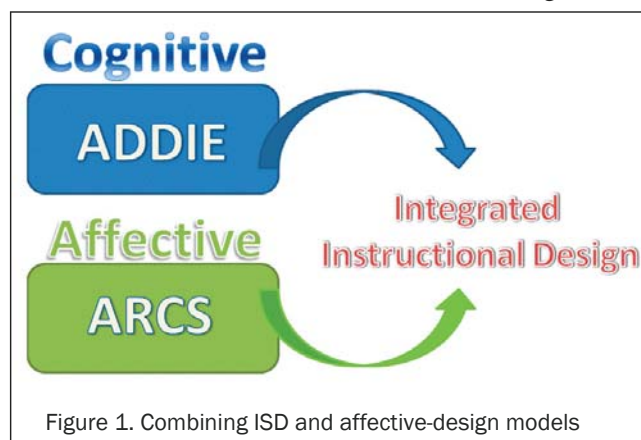


Figure 1. Combining ISD and affective-design models

education while engaging their desires to continue lifelong learning.

Cognitive tools allow students to interact with information to acquire, synthesize, create, and share new knowledge. Technology allows students to use cognitive tools to seek and present information while organizing and integrating knowledge.¹⁹ Technology facilitates this process by enabling the learner to access and retrieve information beyond the limits of memory, which enables the student to return to previous information, engaging it throughout the learning process.¹⁹

Cognitive tools are distinct in their implications of technology. Jonassen and Carr⁹ distinguish the impact of learning from technology and that of learning with technology. Simply stated, when students work with technology, instead of being controlled by it, they enhance the technology's capabilities, and the technology enhances their thinking and learning. This interaction empowers learners to become active and responsible filters of information who engage in directing their mental processes. Cognitive tools should allow students to "activate metacognitive learning strategies."⁹ Metacognitive learning strategies are used when students encounter new information, connect it to their prior knowledge, and then construct and revise their schemata.⁴⁴ The effective use of cognitive tools should enable learners to undertake this process and assist them in experiencing cognitive processes that would be impossible without such tools.⁴⁵

TECHNOLOGY TO PROMOTE AFFECTIVE LEARNING

Research has proven that learners who are not engaged and motivated are not learning as effectively as their peers who are engaged and motivated. According to Rose and Meyer,¹⁴ educators engage and motivate by providing a choice of content (print, audio, information, video, simulation, and instruction), adjustable levels of challenge, and choice of learning context since learners are unique, like fingerprints. Technology enables designers to embed video, pictures, sounds, and story lines while providing links to additional information and social networks that learners can access. In multimedia learning, the student engages in three cognitive processes: selecting, organizing, and integrating based on dual coding theory.⁴⁶ Additionally, the affective domain is engaged through an emotional story, an evocative image, a video, or mood-provoking music.

By properly designing and integrating with correct technology, the educator can emphasize the desired effect

to engage the learner to promote knowledge construction and problem solving.⁴⁷ For example, consider an online instruction consisting of text explaining that one should avoid filling a gas can in the bed of a truck. Now consider the same learning goal using video showing an individual at the gas station as gas fumes—ignited by static electricity—explode, and flames engulf the truck. Such poignant examples, delivered by means of technology, are designed to engage emotions while making people think about potential consequences.

Another proven influence on affect is socialization and personal interaction with others, including students and faculty. Social interaction can lead learners to make strong internalizations and can affect their reasoning and beliefs. Learners' comprehension or retention of knowledge (cognitive learning) as well as their feelings about, attitudes toward, behavior during, and satisfaction with the course (affective learning) may also be influenced. Social presence has emerged as an important social factor in the field of education. To understand the concept of social presence, one must understand what socialization and presence entail.⁴⁸ According to Kandwar and Swenson,⁴⁹ socialization refers to the "process by which people learn the characteristics of their group and the attitudes, values, and actions thought appropriate for them." Presence—important in social learning to reach learning goals—is reported to have positive effects on student perceptions of the course's communications and relevance.⁵⁰

The recent advance of several new Ed Techs such as online learning environments, social networking, mobile devices, and intelligent agents is reshaping the nature of Ed Tech. These technologies allow asynchronous and synchronous communication that facilitates socialization and social presence. Technology can facilitate communication across barriers of time and distance while enabling virtual communities with affective and social support that fosters deeper shifts in education practices.⁵¹ Educators are using these advances to meet affective learning objectives. The following Ed Techs focus on current and ongoing capabilities, thus facilitating the affective educational processes.

ONLINE LEARNING ENVIRONMENTS

Online learning environments encompass a variety of types and styles, providing different capabilities such as content management, discussion, assessments, and messaging. If properly designed and employed, these environments can facilitate affective and social interactions. The key is providing social, learning, and

technology support in the learning environment.⁵² All three areas impact affective learner characteristics. Successful learning environments must facilitate a variety of learners and educators across the spectrum of affective and cognitive knowledge levels. Successfully providing such support requires instructional designers to consider the ID process for the learner and to plan for costs, logistics, and faculty support in all three areas.

SOCIAL NETWORKS

Social networks and social learning are coming of age as technology grows and the Internet expands across the world. Social learning can take place in discussion forums, chats, blogs, wikis, and virtual worlds. Social theory provides insight into why social networks need to be part of the learning process. According to social-learning theory, human behavior is based on continuous reciprocal interaction among individuals in terms of cognitive, behavioral, and environmental influences.^{41,53} Preece⁴⁵ emphasizes that, if online communities wish to be successful, developers and designers need to pay attention to social as well as technical issues while infusing sociability in communities that depend on trust, collaboration, and appropriate styles of communication.

Online-learning communities normally congregate around formally organized learning activities. Wenger's⁵⁵ concept of communities of practice (CoP) has gained acceptance across the education domain, enabled by new technologies that permit the development of virtual CoPs. Air University's Commander's Connection is one of those communities that has proven successful in allowing new and current squadron commanders to get together virtually and educate, assist, and update each other. CoPs have provided motivation and emotional support while allowing peers to operate in real-world contexts.⁵³

Technology not only has the capability to engage students by enriching the learning environment, but also can assist the faculty. Professional networking can link educators as a community of peers to help establish best practices and pedagogical strategies. Such online communities also assist faculty engaging in research and provide a means for them to compare cognitive and affective strategies. Distance-learning technology also enables teachers to reach more students than face-to-face meetings would allow. An experienced teacher in the role of subject-matter expert may participate in the design, development, and implementation of both an online class and pedagogical techniques focused on cognitive or affective strategies that can aid novice educators; such a teacher could also act as a mentor.⁵⁶

The most common method for social interaction in CoPs and other online venues is the discussion forum. The creation of a discussion forum to encourage social interaction among individuals while they undertake online studies has become a common practice as increasingly sophisticated learning-management systems pervade education. Pilkington and Walker⁵⁷ assert that effective teaching and learning is predicated on the forum's capacity to facilitate collaborative and critical discussion to "develop student ability to reason" for both cognitive and affective learning. As Roberts⁵⁸ suggested, it is not just about participating but about how this participation can enrich student-learning experiences.

CoPs, discussion forums, or online chats are all ways to integrate social learning and networking with the educational process. Learners are able to extend their range of learning opportunities by collaborating with others to achieve goals and complete assignments not otherwise possible. According to Woods and Ebersole,⁵⁹ a properly designed social-learning network facilitates interconnectedness and shared responsibility for learning outcomes, allowing cognitive and affective aspects of online learning to produce optimal results. Technology has facilitated social learning and brought it to a higher level of educational awareness. Further research is necessary to determine the best means to exploit it for optimized learning.

VIRTUAL WORLDS

Perhaps we are reaching the next stage of social presence through the use of virtual worlds, which are gaining acceptance as a viable teaching and learning tool. Virtual worlds can provide an immersive environment that facilitates a strong social presence. They allow simulated experiences not possible in school settings, increase learner engagement by visually immersing students, support new forms of interaction and collaboration with the potential to increase students' knowledge and skills, and build self-efficacy.⁶⁰

Virtual experiences can have a more profound influence on affective outcomes than other pedagogy because multiple senses (visual, auditory, and tactile) are involved. Additionally, learning in virtual environments can be tailored to individual needs. Rather than learning by listening to lectures or reading, students will be able to access information, work collaboratively, and evaluate knowledge using virtual simulations. Although virtual worlds in education and training are still in their infancy, they show potential.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY AFFECTIVE COMPUTING: HUMAN/COMPUTER INTERFACE

As discussed earlier, it is problematic to assess short-term affective status, and it is even more difficult to measure long-term affective learning outcomes. However, advanced technology is promising new means to provide affective feedback. The Massachusetts Institute of Technology (MIT) is actively researching ways to measure the affective state of learners via technology. One aspect of MIT's research is the affect-sensitive AutoTutor, which aspires to keep students engaged, boost self-confidence, and maximize learning by narrowing the communicative gap between the highly emotional human and the emotionally challenged computer.⁶¹ AutoTutor is intended to be responsive to learners' affective and cognitive states. Whether or not the affect-sensitive AutoTutor positively influences learning and engagement awaits further development and empirical testing.⁶¹ AutoTutor represents just one of a handful of related efforts currently being researched. Technology that senses or measures human affect will need to be considered as we design our future educational and training courses.

AFFECTIVE-REASONING AGENTS

Affective-reasoning agents are similar to an expert tutor who uses artificial intelligence to respond to a learner's cognitive needs. These agents parse learner responses for affective content and respond realistically with correct emotional expressions to the human user. Similar to affective computing, they have the potential not only to provide social-learning contexts intertwined with affective reasoning, but also to provide a way to reach learners with inspiring, affective presentations and realistic experiences. If properly designed and executed, affective-reasoning agents can also offer powerful affective feedback, which can take the form of natural conversation, gestures, or verbal clues, allowing the learner better insight into and connectivity to the educational outcome the designer intended.⁶² Like the work at MIT, affective reasoning is in its infancy, and more research is needed to find the proper mix of technology and design.

MOBILE LEARNING

Technology also enriches learning by extending education and training away from normal education sites. Learners can take learning on the road, using laptops, mobile-learning devices (m-learning), and wireless or wired networks. Learners can then tie into web sites,

social networks, or e-learning sites (eg, Blackboard), where they can engage in research, communicate with students or faculty, write papers, do homework, take tests, read required articles, or even catch the lecture they might have missed. Mobility allows formal and lifelong learners to control the learning experience in a number of dimensions.⁶³

Mobile technology allows learners to tailor education to their lifestyles. Learners can stay connected with other students, faculty, and instructional resources. The result is that learners feel more comfortable with the educational process and are more likely to internalize what they are studying and sharing.⁴⁰ Further, some learners are tied to their friends and business activities through their mobile devices, and the trend of using the devices may be culturally ingrained. The combination of convenience and connectivity can increase the level of social presence, which can improve the level of affect toward learning. The use of mobile devices requires active interest and precludes the passive process found in some traditional learning environments.⁶⁴ Businesses are starting to look at ways to take advantage of mobile and m-learning capability, including learning-content systems, assignment reminders, and learning aids. According to the eLearning Guild, over 30 percent of organizations surveyed currently deliver some amount of learning content through mobile platforms (eg, iPod, Blackberry, or other smartphones).

LEADERSHIP

The affective domain is vital to overall learning, but it holds special interest to leaders and those individuals who develop tomorrow's leaders. Leadership requires influencing people's attitudes, motivations, and goals, which correlates directly with the factors comprising the affective domain. All leaders must be able to address problems and make decisions, but truly effective leaders must be able to create positive affect in themselves and their followers to motivate everyone toward a common goal. This synergy between leadership and affect makes affective learning a vital concern to the Air Force. The most likely means to develop motivated leaders who can motivate others is to cultivate them through substantive affective learning in Air Force education and training programs.

One approach to acquiring leadership skills involves studying the philosophy, habits, and methods of one or more highly successful leaders and then trying to develop a personal leadership style based on a single leader or a composite of several.⁶⁵ This method relies on inspiration

to create affect in the learners toward leadership. A well-designed leadership course should provide a wide variety of leadership examples and highlight key achievements and methodologies that reinforce desired philosophy and traits. Ed Tech's integration of video, audio, or other multimedia to grab learners' attention by introducing relevant, informative, and inspirational leader aspects provides essential learner ownership.³¹ Additionally, designers need to provide learners with opportunities to conduct discussions, engage in authentic practice, and build confidence as they apply and synthesize the desired philosophy and traits.

Recently, practitioners of leadership and business development have become increasingly interested in the formation of leadership networks as a way to strengthen relationships among leaders. Within groups, peer members build relationships with each other, based on cooperation rather than a chain of command.⁵⁵ Group members converse about their experiences as part of a shared social/cultural community, or perhaps just as people who share similar values.⁵⁴ Learners participate in exercises virtually, online in games, or through authentic role-playing opportunities to build the confidence vital to leaders. Designers can use the advantage of technology to allow the learner to replay scenarios, discuss issues with peers, or try out a different leadership philosophy. These activities can occur whether learners are collocated or geographically separated. A related process entails developing future leaders through mentoring, which also relies on social relationships but involves interactions not only among peers, but also among senior leaders and younger protégés. The desired end state still requires the creation of positive affect in future leaders and their followers to motivate everyone toward a common goal.

RECOMMENDATIONS

The results of this study give rise to several recommendations that could help Air Force education and training develop knowledge-enabled Airmen and foster leadership. The first suggestion is to institutionalize affective learning throughout all aspects of Air Force education and training:

- Integrate affective objectives into the ID process.
- Develop and adopt a combined ID methodology that merges cognitive and affective concerns.
- Develop Air Force faculty who are sensitive to the student's affective states, and devise empirically validated methods to positively impact affect.
- Promote policies that encourage affective-learning tactics, techniques, and procedures throughout Air Force education and training programs.
- Implement experienced Ed Tech manning positions at higher headquarters along with a similar institution at Air University.

Significant integration of affective learning will be possible only with the buy-in of Air Force leadership. Senior leaders must recognize the importance of affective learning and work to institute policies that promote its use in all Air Force education and training programs.

A second suggestion is that the Air Force actively develop and apply social networking and other technologies described in this study to achieve affective-learning goals. This may be problematic due to current limitations imposed by network security. Discussion boards, CoPs, streaming videos, chats, blogs, and other applications enabling social interactions are encumbered with security policies on military networks. Consequently, educational networks may be necessary before social networking technologies can be employed throughout the Air Force. However, it is important for the Air Force to cultivate lifelong learners by encouraging engagement and social interchange during the learning process. Social networking is being exploited in civilian education and promises to change the face of learning from directed information exchange to a more learner-centered approach.

A third recommendation is to conduct further studies on affective learning to address questions regarding its use in and impact on Air Force education and training:

- How can cognitive and affective-design methods be combined to create a more effective overall curriculum-development process?
- What assessment or survey methods provide the best measurement of a learner's affective state and success in meeting learning objectives?
- How does the learner's affect influence cognitive learning?
- Which methods and technologies are most effective in building positive attitudes, motivation, leadership, and confidence?

CONCLUSION

This study is intended to help Air Force leadership and educators better understand the importance of affective

Leveraging Affective Learning for Developing Future Airmen

learning in the development of Airmen as lifelong learners. Affective learning concerns learners' attitudes, motivations, beliefs, and emotions. Unfortunately, the affective domain has been a neglected area because its characteristics are neither directly observable nor easily measured. Consequently, most educational systems evaluate student performance against cognitive proficiency rather than against affective measures. However, it is important to realize that affect is critical to the overall learning process since cognitive learning depends on attitude, motivation, and other affective factors.

It is necessary to include a learner's emotional/cognitive state in the ID process to assist the learner in understanding the efficiency and satisfaction of the learning process. ID that merges affective and cognitive objectives is even more critical as more instruction is conducted through distance learning without a facilitator present. An important Air Force goal should be to partner technology with the affective and cognitive domains to provide distance students with an experience similar to that of in-residence students.

Technology offers the opportunity to promote affective learning through multimedia, social networking, mobile learning, and more. Additional study is needed to assist short- and long-term affective gains using technology. Social networks and learning are having successes and failures; further research is needed to gain more understanding of affective and cognitive linkages in social-learning environments. It is imperative that technology support education and not the other way around.

There is a great deal of overlap and synergy between the concepts of affect and leadership. Successful leaders must be able to motivate themselves and those they lead toward a common goal. How we encourage today's learners impacts how they develop into tomorrow's leaders. To be successful, affective learning must be institutionalized into Air Force culture, including strong support from senior leaders.

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Problem-Based Learning Preparation for Physician Assistant Faculty

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ABSTRACT

This study explores facilitator preparation for a physician assistant problem-based learning (PBL) program. A qualitative study approach was used to investigate the experiences of 7 faculty members from 2 separate physician assistant PBL programs within the United States. Data was collected through interviews using open-ended questions that were recorded and analyzed. The results revealed important themes related to topics that addressed the faculty participants' personal experiences when first beginning this method of teaching. Issues addressed included the facilitator's outlook towards PBL, previous experiences which helped to make a smoother transition into their teaching position, approaches that assisted in preparing faculty and students to teach and learn in a PBL program, academic resources referenced by faculty members, and the use of nonclinical tutors in a physician assistant PBL program.

INTRODUCTION

Medicine has evolved greatly over the last century, but the way in which many institutions are educating those studying this discipline have not. The standard continues to be "chalk and talk" and "death by PowerPoint" as a way of depositing information into those seeking knowledge in the medical field. Many lecturers continue to deliver their neatly wrapped presentations. Unfortunately, it has been noted that students become mentally detached within the first 10 to 20 minutes of lectures. Learners are then left with the options of either attempting to extract the information from texts, or possibly questioning others who have taken the same instruction for exam outlines.¹ The issues related to lecture-type teaching are long-standing. Although the banking model² still exists in adult education, a variety of options have been explored as possible substitutes for this type of learning.

A search has begun by some to find alternate ways of presenting practitioner-based information. In pursuit of this goal, medical programs have reviewed the way in which this community conducts its business, and have attempted to mirror that in the way students are taught. In reality, practitioners are first presented with a problem. That problem could be a complaint of a headache or abdominal pain. The caregivers then investigate using multiple tools to come to some type of conclusion. Medicine has also incorporated a strong team approach to curing the ill. This team mentality can be observed, whether in an outpatient clinic or in a surgery suite. The ability for a group of individuals to

communicate well and work together towards an objective results in positive patient experiences and a happy staff. An educational approach that supports learner development with a strong team mentality, clear critical reasoning skills, and complex medical knowledge and decision-making would be invaluable.

Problem-based learning (PBL) has been considered as a possible educational tool to support this needed evolution.³ PBL education begins with a problem. Students then explore the problem while working in groups. The learners are required to take a team approach in analyzing the situation and applying critical reasoning skills to ultimately evaluate and formulate solutions. Simply stated, this teaching strategy mimics the course of patient care as seen in a clinical practice. This technique is vastly different from traditional medical education. In this latter form of pedagogy, students are first required to memorize packaged presented material in a lecture format. Later the student is required to retrieve these abstract ideas and apply them to a clinical problem.

Learning through problems has had its origins from before the time humans walked upright. To be first challenged with a problem, then have to resolve it has been the standard for our development. More recently, this method of education was resurrected and studied. To date, this form of teaching has been adopted by multiple disciplines in a variety of pedagogical roles. Although some scientific and medical programs have adopted PBL formats, physician assistant (PA) programs have been slow to implement it. Shared

knowledge concerning this particular group and PBL in the form of studies and published literature is limited. Also, some universities have had a difficult time convincing their staffs that the revamping of their educational practices is a wise endeavor. Shifting the curricula and teaching methodology of a program is time-consuming and requires a philosophical buy-in from faculty and administration. These types of changes can often create friction within a program if individuals are unwilling or uninterested in working toward the success of the new approach.⁴

A study designed to examine a skilled way in which to implement a PBL PA program, although important, would be an immense endeavor. Some of the elements that would need to be addressed include logistical support, teaching topics, time, student preparation, and grading systems. Of these possible issues the preparation of a teacher who is not familiar with this particular mode of instruction would also be invaluable.

The teacher takes on the role of facilitator in a PBL format. The facilitator helps to guide students through the curriculum while promoting reasoning skills and self-directed learning. In addition, facilitators offer information in a capacity designed to cultivate enthusiasm and intellect. Students involved in a PBL curriculum then use critical thinking, teamwork, and research to address the topics needed to complete the course requirements. We find that the facilitator's job is multifaceted. In addition to guiding students, a balance between individual and group work must be achieved. The time allotted for student exploration must be managed. In addition, references and resources that fulfill the goals of a course must be identified. Student group dysfunction is also a possibility. The way that this is managed is as equally important as the presentation of rules as to how the groups will conduct themselves. If a new facilitator has a strong background in lecture based education, the change away from a teacher centered classroom to one that is student centered can also be a difficult task. This transition should be well thought-out and executed correctly for this style of instruction to be well received, and learning expectation outcomes to be achieved.

STATEMENT OF THE PROBLEM

Instructors involved with a PBL program must be able to manage both their knowledge of the subject matter and their facilitator skills. Knowledge of the subject

matter includes their use of expertise, cognitive congruence, and test orientation. The facilitator skills to be managed are authority, role congruence, and cooperation orientation.⁵

A facilitator must be able to gauge how much of their knowledge of the subject matter should be shared with the students. For some tutors, it may be easy to fall back on previous teaching skills and start lecturing about the material instead of fostering additional research and inquiry. Cognitive congruence as related to how well the facilitator can communicate with the students, at their current level of understanding, must also be managed. Test orientation refers to how well the instructor directs students to what should be learned for the successful completion of the course requirements.

Facilitator skills needed by the teacher begin with the amount of authority used to steer student learning. Constant interruptions by the instructor can be detrimental to the PBL process. Role congruence, or the amount of understanding of the student's situations and perspectives, is also required. Finally, cooperation orientation refers to the ability of the facilitator in the management of group dynamics. Cooperation orientation will vary from relieving any frictions identified within the class to help in building positive relationships.

Therefore, the topic of this study was to determine what types of preparation might be needed for an instructor of a physician assistant program to be successful in the adoption of a teaching style that includes problem-based learning facilitation. In addition, the triservice physician assistant program located at Fort Sam Houston, Texas, is currently restructuring its curriculum. The changes that are planned for this program include portions of the course to be taught in PBL fashion. This study will also directly help with this planned transition of the Army Medical Department.

METHOD

The purpose of this study was to identify what types of preparation would benefit a facilitator who would assume a new teaching role in a PBL program for physician assistants. The research questions were:

1. In what ways have PA instructors been prepared to conduct PBL in a PA program?

2. In what ways have PA programs prepared the curricula, students, and logistical issues which directly or indirectly support PBL instructor readiness?

A qualitative approach in data gathering was used to address the research questions. This method was chosen because the study conducted was exploratory in nature. An open-ended approach to data gathering was essential in finding a descriptive interpretation of the phenomena. Open-ended questions were used to gain insight into PBL facilitator preparation. During interviews, individuals clearly translated their issues to provide a coherent understanding of what they felt was needed for such a transformation. The use of a qualitative approach provided additional insight related to the respondents' attitudes, beliefs, and motives.⁶

SAMPLE

A web search was conducted to locate universities that had physician assistant programs which use problem-based learning in their curriculum. Two American universities were identified and approached for respondents to take part in this study. One institution is located in the midwest and the other in the southwest. A total of 7 PBL facilitators from these programs were interviewed. Six of those participating were certified physician assistants. The last was a practicing family medicine doctor. The average amount of time these individuals had been working as a facilitator in a PA program was 3.3 years, and the average amount of hours per month they were in an active PBL setting was 48.8. Five of the respondents were female, two were male. All of the respondents were currently licensed to practice medicine and were working part-time as providers in local practices in addition to their full time teaching duties. Five of the participants answered "all topics" when asked about the topics of instruction for which they were responsible. Of the last 2 facilitators questioned on teaching responsibilities the first answered electrocardiograms, evidence based medicine, advanced cardiac life support, basic medical procedures, and antibiotics. The last instructor said he was responsible for facilitating physiology, pharmacology, clinical procedures, gastroenterology, and cardiology. The teaching and medical experience and demographic data are presented in the Table.

DATA COLLECTION

In this study, the semistructured interview was used as a data gathering technique. This approach allowed the informants to discuss their experiences in ways that

made sense to them, yet was focused enough to connect with the research questions. One to 2 hours of time were allotted for face-to-face meetings. Locations that were both quiet and void of possible interruptions were chosen for these encounters. Anonymity was achieved by hiding the participant's identities through number coding; all the participants were given a number code so that no links could be made between their remarks and them. In addition, no information collected during the interviews was shared within the departments at which those interviewed were employed.

A set of verbal questions to determine demographics was first presented (Figure 1). The demographic questions enabled the researcher to better understand both the teaching and medical experiences of each participant. The interviews were then conducted immediately after the demographic questions were answered. Twelve questions were asked to each participant in the order presented in Figure 2. All interviews were conducted by the investigator and were captured using a digital recorder.

The questions developed for this study were designed to promote open discussion. By supporting this type of dialogue through an open format, valuable insight was gained into the issues under investigation. There was no cost to those participating in these dialogues, nor were there any incentives offered.

DATA ANALYSIS

All interviews were transcribed. The initial information collected was viewed as raw data. This material was then analyzed using the process described by Hitchcock and Hughes.⁷ The first goal was to become well acquainted with the interviews. This included multiple reviews of the audio files and transcribed discussions.⁸ The texts were then condensed by eliminating information which did not pertain to the study questions. After this had been accomplished, a second approach was initiated.

The data were then examined for repeating words and phrases that might be used to code the information into logical segments. For this technique, the codes were applied in order to develop multiple categories which were originated from the interviews. Grouping and examination of the information further resulted in recurrent themes. In using the collected material to develop concrete meaning, the results were

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Profiles of study participants by demographics and medical and teaching experience.							
Gender	Female	Female	Female	Female	Female	Male	Male
Age	52	43	41	55	39	54	38
Ethnicity	White	White	White	White	White	White	White
Years teaching in PA programs	6	7	1.8	9	1.5	1.5	1.5
Years in current position	6	7	1	9	1.5	1.5	1.5
Years teaching with PBL	6	13	1	9	1.5	1.5	1.5
Years teaching in lecture format	0	0	0.8	3	1	0	0
PBL hours per month	90	60	12	12	80	12	80
Topics of PA instruction	All	All	All	All	All	Physiology Pharmacy Clinical procedures Gastrointestinal Cardiology	Electrocardiogram Evidence-based medicine Advanced Cardiac Life Support Basic procedures Antibiotics

“grounded” in the data.⁹ The grounded method for analyzing data was used so the examiner was not as likely to impose his own biases and preconceived perspectives on the information.

The themes derived from the identified codes were then annotated. The themes were used as a basis for interpretation of the information that was initially

collected. These summaries captured the essence of what the respondents felt was important or might have been lacking in their experiences when beginning their new roles as PBL facilitators. In the identification of recurrent themes, many of the respondents supported each others’ perspectives on PBL facilitator preparation. Because of this agreement, second interviews to clarify the respondent’s viewpoints were not requested.¹⁰

FINDINGS

The questions posed to the interviewees exposed large amounts of information concerning PBL facilitator preparation. There were 2 goals of this study: to identify in what ways PA instructors have prepared to conduct PBL in a PA program, and to identify ways in which PA programs prepared the curricula, students, and logistics issues which directly or indirectly supported instructor readiness.

The first question presented to each of the respondents required them to share personal thoughts on their definition of PBL. The most common remarks made were that PBL was based on problem solving and was student-centered. It was also mentioned that PBL developed both critical thinking skills and life-long learners. All of these comments were congruent with definitions identified in current PBL literature.¹¹

I would like to ask you some demographic questions. Your participation in answering them will help in this study. The data collected from demographics may uncover information specific to certain groups of individuals, which can later function in the designing of a PBL program that caters to these differences.

1. What is your ethnicity?
2. What is your age?
3. How long have you been teaching physician assistants?
4. How long have you been teaching in your current position?
5. How long have you been a facilitator for PBL?
6. Did you ever teach at a PA program where you used a lecture based format?
7. How many hours per month do you work as a facilitator for PBL?
8. What topics of instruction are you responsible for as a facilitator?

Figure 1. Format of interview questions to determine the demographic makeup of study participants.

Four major themes related to these questions were produced from the data. The themes identified include attitudinal factors and previous experiences that support instructor transitions, insights into new instructor professional development, and the importance of preparing students to learn in PBL programs.

ATTITUDINAL FACTORS AND PREVIOUS EXPERIENCES THAT SUPPORT INSTRUCTOR TRANSITIONS TO PBL

Facilitator Support for PBL

All of those interviewed felt very strongly that PBL was a good approach for the instruction of physician assistants. Common responses from the subjects interviewed included phrases such as:

I think the program is very effective.

I think it's terrific.

I think it is an excellent way for teaching PAs and in teaching medicine in general.

This support felt by staff members was not without reasons. Interviewees felt that the method supported authentic clinical medicine practices:

So my feelings are very strongly positive, because we learn in the way that we need to know it as a clinician. PBL is structured so that it closely mimics what students will ultimately face once in practice.

This argument has been observed in the past in other cited literature.^{11,12} PBL supports clinical medicine in a unique way by mirroring actual medical practice.

Previous Experience

A strong buy-in for this educational forum, although important, was not the only consideration discussed in helping with the transition to PBL facilitation. Staff members were quick to identify their thoughts concerning what previous experiences might support a smooth transition into such a teaching position. All faculty members arrived at their current position through different routes. The variations included previous clinical experiences, educational backgrounds, and for some, other teaching jobs. These differences had an impact on thoughts concerning what previous experiences might cause a new PBL physician assistant instructor to have a smoother time adjusting to this new method of instruction.

Comments were made concerning the need for a generalist's background. It was thought that since they were teaching a variety of medical disciplines, being a

specialist in one given field might restrict a facilitator's ability to manage the variety of material that must be addressed. For example, one participant remarked:

I think that general practice or family practice would be helpful just because it depends on what you tutor. Our program is set up and our units are on specific disciplines, so if you're an expert on that topic it will be very easy for you. If you get stuck teaching neurology and you are not experienced in it, then it will be more difficult for you.

The wide range of medical topics presented in these programs and the level of experience students may

The following questions I am going to ask you have been designed so that knowledge can be gathered to help answer 2 broader issues concerning problem-based learning (PBL). These issues are:

- In what ways do current physician assistant instructors specifically prepare themselves to implement problem-based learning in their program?
- What are the perceptions of current physician assistant facilitators in terms of their programs preparing the curricula and logistical issues of making a change to problem-based learning, which directly or indirectly support instructor transition?

1. PBL education can mean a variety of things to people. Can you explain your definition of PBL?
2. Could you tell me about your feelings regarding PBL and its effectiveness in instructing PAs?
3. Could you tell me about your feelings regarding PBL and its effectiveness in instructing PAs?
4. Were there facilitator preparation topics you wish you had more insight into that could have better prepared you for your new teaching role?
5. What should a preparation program for new facilitators look like?
6. We already discussed some of the possible topics that would have better prepared you for this new teaching role, but do you have any other comments on topics that might help other instructors?
7. How do you now plan/prepare for an upcoming course or class?
8. Have you identified any academic resources that are needed for a facilitator? If so, please explain.
9. How do you prepare your students for their role in a problem-based learning group?
10. How is time managed in your classes?
11. How do you achieve a proper balance between individual and group work?
12. What other insights have we not discussed that you can offer future PA facilitators using PBL?

Figure 2. Format of interview questions to determine the teaching and medical experiences of study participants.

have will often lead to a variety of differential diagnoses presented by a group. Having a broad range of clinical experience, although important, is not the only criterion concerning facilitator transition that emerged.

Having been exposed to PBL while undergoing initial PA training was another possibility discussed. It should not be surprising that those who attended a PBL program while first becoming a PA felt their experiences gave them greater insight into this method from the start of their new teaching position:

In our opinion, someone who has been through PBL adjusts to it more smoothly than those who only have previous work experience. Graduates who come back to our program or they have had some PBL previously and at least understand what it is usually adapt easily. However, someone who comes from a background of primarily receiving lectures usually they fall back into that teaching mode. In PBL that is not done; we must hold ourselves back and let the students do self learning.

These remarks offer a clearer picture of a new facilitator who would be expected to have the easiest transition into the teaching role. Participants agreed that prior PBL exposure in addition to a broad clinical background may significantly support PBL instructor transitions.

Nonclinical Facilitators

A final subtheme regarding previous experience and transition to PBL instruction addressed the negative feelings about the use of nonclinical tutors as facilitators. The interviewees did not support the idea of nonclinical tutors, although they did recognize that this teaching practice has been described in the literature:

The typical program states that anyone is capable of doing PBL, so I think you need to eradicate that form of program and be more practical.

Physician assistant programs do not have the luxury of time. They are required to produce a competent clinician in a very small span of time. Using a nonclinical tutor as a facilitator could cost a program valuable time in educating their students:

The group would correct themselves if we were in there for 20 hours, but that is not possible. So the main thing for facilitators is to not fool themselves. They must be clinicians to be effective tutors in PA education.

Students often relate well to teachers who can offer real-life experiences while working in the field of

study under examination. The faculty from the 2 programs stressed this and described sharing their personal trials of being a clinician, which was accepted warmly by their students. Having a nonclinical facilitator negates this important venue when attempting to educate a group. In addition to having previous clinical experience as a prerequisite to applying this method, additional professional development was also identified as critical.

NEW INSTRUCTOR PROFESSIONAL DEVELOPMENT

Faculty preparation upon coming to a PBL program was discussed in depth. Two common themes arose from the interviews. A short preparation course that included some mock PBL sessions and a mentorship shadowing program were identified as critical preparation elements:

We do a very nice job. We do role playing, which I think is the best thing to do besides being dumped in as a tutor and see what happens.

Five of the 7 participants interviewed supported the opportunity to attend a one- or 2-day mock PBL session. Participants of this training used role play to prepare themselves through instructional scenarios. New staff members became the students as a senior member took on the role of a facilitator. The role players would take breaks at specific times to review what had transpired and what individuals could have done to maximize the outcome for those involved. Immersion in a training exercise that closely mimicked typical group behavior was the reason this experience was so highly valued.

Finally, a mentorship program was identified as the most important aspect of facilitator preparation. One participant suggested:

I think the biggest thing is mentoring. The other thing we do is once we get a new person who comes in we have someone go in with them at least the first few times they are tutoring.

The ability to identify and access a trusted advisor was instrumental in this professional change. These relationships included new faculty first observing their assigned mentors in an actual tutorial group. As they became more comfortable, they would assume stronger roles as assistants. Finally, their mentors would observe the new facilitators' work and offer critique until a comfortable level and institutional

standard was reached. New faculty arrivals were also expected to review and study the course work so that they would be prepared to address instructional topics in addition to the outlined professional development.

Preparing to Teach for the First Time

Preparations for the first teaching experience was consistent across the data set. In preparation for leading an upcoming group session, the staff liked to review the case, the students' text books, and MD Consult* for any recent changes to the material. This allowed them to have an updated foundation of the course work. One individual made what they called a "word target list" after reviewing these resources. This list was used by presenting the words or phrases compiled at specific times during a session, which were then used by the students as hints to guide them through the material. In addition, the "word target list" was used as a listening tool for the facilitator which helped her gauge the amount of progress that was being attained in the classroom. She offered:

I review the learning issues sheet and then go to resources to review for the case even if I have taught it before. Then I go back to the learning issues sheet and make notes like little word targets that I'm going to look for and hopefully they [the students] will bring me back through their learning issues. I will then spring off of that learning issue and point some of those out, to track them and puzzle weave them into the learning issues.

The review of current medical literature for an upcoming tutorial is crucial and common in PA education practices. The medical field is constantly undergoing reforms based on published current studies with the development of new pharmaceuticals, instruments, and techniques. Although the identification of facilitator preparation topics was the main goal of this study, the participants stressed that a continuously updated PBL knowledge base for the students was also critical for a facilitator.

Preparing the Students

The discussions for the participants changed as we began to explore what their programs had done in preparation of such things as the curricula, students, and logistical issues that directly or indirectly helped with instructor transition:

When they [the students] interview, we do a mock PBL so they already have an idea. Our website talks about

PBL but we encourage them all to be aware of PBL before they ever come to the program.

Students are encouraged to read about PBL on their own. In addition they are given the opportunity to observe an actual tutor group. Once they begin the course work, time is set aside to identify ground rules for the groups. The class determines consequences for tardiness, how it makes the group feel, why it is important to start on time, how to give and take criticism, when breaks will be taken, and for how long they will be. Some of the faculty also stated that physical exams should be taught early in the program to support the clinical philosophy of PBL.

One of the interview questions addressed the achievement of a proper balance between individual and group work. The participants in this study suggested this was not a concern in their facilitation experiences. It was stated that all students are responsible for their own individual learning, and, if they do not succeed in their personal tasks, the group fails. It becomes obvious to the group and the instructor if one of the participants is not prepared. A participant also mentioned that the learners are so busy with keeping up with the course work, they do not have time to complete another colleague's assigned tasks. The demanding obligations imposed on each learner ensures individual work will be performed. In addition to extending the time allotted for early group work, student and facilitator preparation defined what was needed for a new facilitator to transition well.

COMMENT

The open-ended questions posed to the interviewees exposed insight into useful concepts regarding facilitator preparation for a physician assistant PBL teaching position. The information collected on the demographics of the participants (Table 1) did not provide the study any additional data which was identified as having an effect on the findings. The first theme presented suggested strong support for the instructional approach for PA education. Not only did those questioned endorse this method, they were excited about being a part of their respective programs. During each of the interviews, every participant used very strong positive verbiage in describing their support for using PBL in PA education. Their commitment to PBL rested heavily in the belief that the method allowed learners to practice, with support,

*<http://www.mdconsult.com/php/217887812-2/homepage>

what they would ultimately face clinically in a real-world setting. Others felt that it also proved effective in student preparation for written exams, and that their pass rates on the Physician Assistant National Certification Exam were very competitive with traditional programs.¹³

Past work and educational exposures were also found to be important factors. When they discussed previous experiences that might help a facilitator transition into this new teaching role, many felt that past participation in PBL training would be helpful. They thought that PAs who were initially trained in a PBL program transitioned to PBL instructor roles more easily. It was also suggested by some that generalists might be more suited to teach in this format because of the wide range of medical exposure they have had. This experience would help them with the broad range of differential diagnoses that are discussed during a case study. Many interviewed also felt that a physician assistant, rather than another type of medical provider (to include medical doctors) would be the best suited for this teaching position. It was pointed out that a PA has a better understanding of the student's clinical role after graduation. The students in these programs were being trained for a primary care setting and not a specialty clinic. This awareness was felt to be important in recognizing when a PA would refer a patient out of their clinic due to the complexity of the case. For a primary care PA, the initial diagnosis and treatment plan of a case study concerning colon cancer is much different from the same patient's situation at an oncology or general surgery clinic. Becoming too in-depth in a case study might result in the use of extra time when these types of programs do not have this luxury.

The last theme related to previous experiences was the use of nonclinical tutors in a physician assistant PBL program. The traditional PBL model suggests that a facilitator need not be well versed in the subject studied. As Woods¹⁴ explains:

Staff may feel uncertain about facilitating a PBL tutorial for a subject in which they do not themselves specialise. Subject specialists may, however, be poor PBL facilitators as they are more likely to interrupt the process and revert to lecturing.

He further advises that eventually students will self-correct and develop the right answers without a clinical expert present. The findings of this study suggest otherwise. All respondents agreed that this might

be true in theory, but they did not feel that it was plausible in the PA education context. PA programs are under great time constraints to cover large amounts of critical material. Without a facilitator with a clinical background, it was believed that increased lengths of time for the students to adequately address all the learning issues would be needed. Having an experienced clinician as a facilitator helps refocus the group when it gets too far from the required learning topics. Learning topics are designed into the curriculum at specific levels within the course work. Students may begin to address material that is designed for exploration at a later date in the program. Refocusing group work saves time and supports curriculum sequencing. In addition, an experienced clinician is better apt to question incorrect information presented in the group. Facilitators without a medical background would not be in a position to identify incorrect data. Having clinical experience would better support efficient learning.

A preparation course for new facilitators was offered at both institutions that took part in this study. Although, each institution felt that their training program was important, those interviewed also felt that it should be limited to one or 2 days, if possible. A training program designed around role playing or a mock PBL session was recommended. In addition, a mentorship program was stressed. It was felt that a new facilitator would benefit greatly by observing and team-teaching in an actual PBL class for a period of time and then having a seasoned tutor observe their first few classes. This experience allowed constructive criticism to be offered on tutor session management. Insight into facilitator techniques was gained through this process as well. A mentoring program was considered vital in the preparation of new faculty.

Part of ensuring facilitator success is a program that prepares learners for their role in this setting. A tutorial group aware of how problem-based learning is constructed helps ensure that these gatherings will attain the goals set by the curriculum. Student preparation in PBL was conducted through a multifaceted approach. It was pointed out that it is important for students to recognize if such an independent educational venue is right for them.

Interviewees stressed the requirement for additional time allotted for early PBL group work. This increase is required for students during their adjustment phase to PBL. In addition to the new educational process,

achieving a grasp of both complex medical concepts and related vocabulary is another considerations for planning more time. Also, the faculty stated the importance of becoming involved with guiding the students early in the program. It was presented that if these measures were not taken, extended time would be required in their initial PBL group work. With additional time already factored into a new class, having students extend an already long day might lead to both student and faculty fatigue. Preparation of the students for their new educational role lays a supported foundation for success for both learners and new faculty members.

In the preparation for an upcoming group session, all 7 facilitators approached the task in the same manner. They reviewed material that coincided with the subject taught by reviewing text books, up-to-date web sites (MD Consult was the favorite), and other references. In addition to these resources, one facilitator used a word-target-list which she synthesized from the same web sites.

There is a lack of published information concerning physician assistant PBL programs. This study sought to resolve some specific issues centered on facilitator preparation in these programs. The data gathered resulted in themes related to facilitator's outlook towards PBL, experiences which helped faculty better transition into their teaching position, and identification of various resources that assisted in preparing faculty and students.

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Critical Thinking Skills: Do We Have Any?

Critical Thinking Skills of Faculty Teaching Medical Subjects in a Military Environment

Carol F. Hobaugh, PhD

Countless course introductions and administrative announcements include the phrase, “in this course we will not teach you what to think; rather you will be taught how to think.” It may be declared so often as to become cliché, however, that goal is not necessarily realized for any number of reasons. Two major issues related to the definition and to the teaching of critical thinking were addressed in 2 important studies that informed my own doctoral research*:

➤ Expert Consensus on Critical Thinking: The American Philosophical Association (APA) Delphi Report (1990). In this landmark study, a panel of 46 well-known scholars and experts in the field collaborated over a period of 20 months to articulate an international expert consensus definition of critical thinking:

We understand critical thinking to be purposeful, self-regulatory judgment that results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based.^{1(p3)}

➤ California Teacher Preparation for Instruction in Critical Thinking (1997): The compelling study, commissioned by the California Commission on Teacher Credentialing, determined that faculty subjects were indeed confident that they understood the critical thinking concepts and were also successful in teaching. Paul states unequivocally that they were also wrong; fewer than 10% of the teachers actually taught critical thinking, could enumerate critical thinking criteria or standards required of students, or provide clear conceptions of critical thinking.^{2(p3)}

There are many regulatory mandates and professional guidelines establishing requirements for critical thinking, particularly with a focus on healthcare. Among those are requirements for nursing, physical therapy, respiratory therapy, dentistry, pharmacy laboratory specialties, social work, and clinical

psychology. The Pew Health Professions Commission also stipulated critical thinking, reflection, and problem-solving skills among their set of competencies for the 21st century.³

In addition to Army training guidance reiterating the necessity for self-aware and adaptive problem-solvers, there emerged a compelling requirement for instructors who not only have relevant experience and skills necessary for training students, but also the ability and expertise to teach critical thinking.^{4,5}

Therein lay a problem. Instructors at the US Army Medical Department (AMEDD) Center and School (AMEDDC&S) have been selected for their expertise in the particular subject matter they are to teach. However, they do not generally have a background or training in education. Nor have they necessarily been specifically trained in critical thinking skills. This is not unlike any number of situations facing many other teachers. Duldtt succinctly describes this quandary:

We, the faculty, are to teach critical thinking throughout the curriculum to all health care professional students so that new practitioners will be able to function effectively and creatively in the changing arena of health care. Somehow or other, in a manner and by a method not stated or clearly understood, we, the faculty, are to do this. However, we, the faculty, are the very ones, to a significant degree, who are alumni of an educational system which historically has omitted the very things we are now to teach.⁶

It was from the Pew Commission’s broad based educational perspective that my doctoral study was conceived, and it was situated in the context of the AMEDD. My study measured the critical thinking abilities of instructors with divergent training backgrounds and experience. All instructors assigned to the Academy of Health Sciences were encouraged to participate in the study. The population was 730 potential subjects. The Noncommissioned Officers Academy was not included in this study.

*Dr Hobaugh’s dissertation, the basis for this article, was completed in October 2005.

Because this research involved the use of a cognitive test, it was exempt from full institutional review board (IRB) review and continuous monitoring. All protocols associated with this research were submitted to the University of the Incarnate Word (San Antonio, Texas) IRB to determine its status. It was understood that personally identifiable information would remain confidential throughout the research and thereafter. Signed informed consent statements were obtained from each participant at the beginning of each testing session.

Participation in this study was voluntary, and at all times subjects retained the option to refuse to participate and withdraw from the study. Results of the study were reported in the aggregate to protect the identity of individual subjects.

In addition to permission sought from the University of Incarnate Word IRB, letters seeking permission and approval for this study were secured from the AMEDD Clinical Investigation Regulatory Office, the Judge Advocate General, the Fort Sam Houston Army Garrison, the AMEDDC&S Chief of Staff, and the Dean/Commandant of the Academy of Health Sciences, AMEDDC&S.

INSTRUMENTATION

California Critical Thinking Skills Test (CCTST). Developed by Facione and associates specifically to assess the skills dimension of critical thinking as defined by the APA Delphi Report, the CCTST measured critical thinking characterized as the

...process of purposeful, self-regulatory judgment. This process gives reasoned consideration to evidence, contexts, conceptualizations, methods, and criteria."^{7(p2)}

The test consisted of 34 multiple-choice questions which were intended to be free of critical thinking jargon and technical vocabulary. No discipline-specific content knowledge was presumed, and although it was designed primarily for post-secondary level assessment, the CCTST had been used successfully across a wide range of subjects from 10th grade to graduate and professional school students.

The CCTST yielded 6 scores: an individual's overall score as well as scores on 5 subscales. The subscales were analysis, evaluation, inference, deductive

reasoning, and inductive reasoning. Facione et al noted that these cognitive skills operate interdependently and interactively rather than as isolated factors; therefore, scores on the subscales were intended primarily as gross indicators of strengths and weaknesses.^{7(p13)} The maximum scores for the overall CCTST and each of the subscales were as follows: overall=34, analysis=7, inference=15, evaluation=12. The last 2 subscales were reclassified and captured as induction=17, and deduction=17. Validation studies of the CCTST Form 2000 produced internal consistency estimates of KR20* equal to 0.80 and 0.78. Because more than one critical thinking skill was being tested with a single instrument, reliability ratings of 0.65 to 0.75 should be considered sufficient.^{7(p15)} Having been developed as conceptually consistent with the Delphi expert consensus definition, the CCTST was assumed to have both content and construct validity. Criterion validity was substantiated with correlations to college grade point average, Scholastic Aptitude Test (The College Board, New York, New York) verbal and math scores, and the Nelson-Denny Reading Test (Riverside Publishing Company, Rolling Meadows, Illinois) scores.

A demographic questionnaire was researcher-developed and included requests for information regarding gender, age, ethnicity, rank, military medical specialty designator (military occupational specialty or area of concentration), education level, teaching assignment, assignment experience, deployment experience, and years of service.

Answer sheets were sent to the publisher, Insight Assessment (California Academic Press, Millbrae, California), to be scored. Insight Assessment returned individual test-takers' overall scores as well as scores on each of the subscales. The demographics data were tabulated by the researcher using SPSS and coordinated with CCTST results as they were returned from the publisher. The data were not used to report critical thinking skills of individual instructors. All results were reported in the aggregate to insure anonymity.

The following hypothesis and ancillary hypotheses drove the study.

H₁: Instructors of military students have the necessary skills to teach critical thinking skills.

*The Kuder-Richardson Formula 20 (KR20), first published in 1937, is a measure of internal consistency reliability for an overall test consisting of several individual items, each measuring some construct. Source: Nova Southeastern University Center for Psychological Studies (<http://www.cps.nova.edu/~cpphelp/class/psy0507/consistency.html>).

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Ancillary hypotheses

- H₂: There are differences in the level of critical thinking skills of officer and enlisted instructors.
- H₃: There are differences in the level of critical thinking skills of instructors teaching leadership courses and those who teach a technical medical specialty.
- H₄: There are the differences in levels of critical thinking skills among instructors teaching in the various medical military occupational specialties.
- H₅: There are differences in the level of critical thinking skills of instructors with a field TOE background, those who have primarily a TDA background, and those who have experience in both types of assignments.
- H₆: There are differences in the level of critical thinking skills of instructors who have combat experience, humanitarian deployment experience, those who have both, and those who have neither type of experience.

Because this study was supported by the leadership of the AMEDDC&S, a great deal of data covering a wide range of variables was collected with a view toward supporting future studies or projects across departments. Data collected specifically for those second and third or ancillary purposes were considered to be tangential to this study. In terms of what is germane, only data specifically relevant to this study were reported. The demographic data, descriptive of the sample, was presented first. Inferential statistics that addressed each of the research hypotheses followed. An alpha (α) level of .05 was used for all statistical tests.

After a review of the Table of Distribution and Allowances,* it was estimated that there were 730 instructors in the sample population at the AMEDDC&S at the time of the study. Three hundred fifty-five (49%) individuals actually participated. Nine response sheets were not usable. All remaining 346 participants were instructors at the AMEDDC&S. The sample included 51 officers and 248 noncommissioned officers (NCOs) as well as 34 civil service instructors (Department of the Army employees), and 13 other

civilians hired under contract to provide instruction in basic medical skills. The numbers represented a lower percentage of both officer and civilian instructors in the sample and were not necessarily representative of the general AMEDDC&S instructor population. On the other hand, NCO instructors comprised 71% of the sample of 346 subjects, a percentage that is much higher than the actual 38% reflected in the AMEDDC&S population of 730 instructors, and suggested that results were entirely representative.

Age was a demographic of great interest because it represented a developmental or natural maturation process. Therefore it was examined in terms of possible influence on critical thinking skills using a one-way analysis of variance (ANOVA) procedure. While the majority of military instructors at the AMEDDC&S are generally assigned in midcareer, the ages of the instructors in the sample ranged from 26 to over 56 years. The sample was disaggregated into 7 subsets, shown in Table 1. There were no significant differences indicated for the overall CCTST score and the analysis, inference, inductive thinking and deductive thinking subscores. However, the level of significance for the evaluation subscore was 0.035 which was less than the level of 0.05. A subsequent Scheffe post hoc analysis revealed the statistically significant difference occurred between the subset 46-50 years with the lowest mean score of 3.41, and the subset 41-45 years with the highest mean score of 5.03. There were no significant differences among the other subsets.

A series of statements on the demographics survey addressed participants' attitudes and opinions regarding critical thinking skills and established the focus for the study. Table 2 presents the frequencies of responses to indicate participants' levels of agreement, ambivalence, and/or disagreement with the statements.

The sample population was segregated into 3 naturally occurring groups: officer, NCO, and civilian instructors. Data analysis was accomplished by using a chi-square (χ^2) procedure to test the association among the 3 subsets. There were statistically significant differences in responses of the 3 groups for items 3 and 6, however, the source of the differences was not found.

*Prescribes the organizational structure, personnel and equipment authorizations, and requirements of a military unit to perform a specific mission for which there is no appropriate table of organization and equipment (the document that defines the structure and equipment for a military organization or unit).

Table 1. Demographic data for the study participants.					
		Sample Subsets			
		Officer	NCO	Civilian	Totals
Instructor Status (missing = 0)		51	248	47	346
Gender (missing = 20)	Male	34	176	27	237
	Female	15	59	15	89
Ethnicity (missing = 56)	African American	3	64	8	75
	Anglo American, Caucasian	39	89	22	150
	Asian American	0	7	0	7
	Hispanic, Mexican American, Latino	2	33	6	41
	Native American	1	3	1	5
	Other	0	11	1	12
Age (missing = 3)	26-30 years	2	11	2	15
	31-35 years	5	98	4	107
	36-40 years	12	87	1	100
	41-45 years	15	39	5	59
	46-50 years	7	10	9	26
	51-55 years	4	2	12	18
	Over 56	4	1	13	18

The preliminary research question for this study asked, “what are the critical thinking skills of instructors at the AMEDDC&S?” The results of the 6 ancillary hypotheses derived from this question are presented in the following sections. Where comparisons with a norm group were indicated, results were analyzed by using independent samples *t* tests to determine significant difference between 2 sample means. The *t* tests were also used to analyze data generated for Hypothesis 3. Otherwise, an ANOVA procedure was used to analyze results of hypotheses involving multiple groups and CCTST scores, reported by the publisher as an overall score plus 5 subscores reflecting critical thinking skills of analysis, inference, evaluation, inductive thinking, and deductive thinking.

It is important to note that a cut score of $n=10$ was applied throughout this data analysis. According to Isaac and Michael:

...in exploratory research, samples of this size are large enough to test the null hypothesis...[and] remain educationally significant.⁸

Statistically significant results were demonstrated in 4 of the 6 hypotheses: H_1 , H_2 , H_4 , and H_6 .

Hypothesis 1: Instructors of military students have the necessary skills to teach critical thinking skills.

It may be generally accepted that instructors, by virtue of the fact that they are instructors, have subject knowledge, skills, and abilities that exceed those of their students. As such,

it is often assumed that their critical thinking skills exceed those of their students as well. A means of verifying this assumption would be to assess the critical thinking skills of both groups and compare them. However, there had been no other critical thinking skills CCTST testing of instructors or students at the AMEDDC&S. Therefore, Hypothesis 1 was answered in 3 ways: (a) self-reporting by responding to questions on the demographic survey, (b) completing the CCTST and achieving a score, and (c) by comparing overall CCTST scores and subscores to normed scores.

The previously noted χ^2 test indicated no significant differences among responses to the demographics

Table 2. Frequency data for participants' responses to statements on critical thinking skills.											
Survey Item	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Missing
	n	%	n	%	n	%	n	%	n	%	
CT skills are essential for the military	162	(46.8)	127	(36.7)	36	(10.4)	2	(0.6)	2	(0.6)	17
Necessary to teach my class CT skills	76	(22)	161	(46.5)	72	(20.8)	15	(4.3)	4	(1.2)	18
CT already included in my instruction	26	(7.5)	123	(35.5)	111	(32.1)	54	(15.6)	9	(2.6)	23
I have sufficient CT skills to teach CT	32	(9.2)	130	(37.6)	127	(36.7)	34	(9.8)	4	(1.2)	19
My CT skills developed from experience	76	(22)	179	(51.7)	61	(17.6)	3	(0.9)	0	0	27
My CT skills developed from education	13	(3.8)	91	(26.3)	155	(44.8)	54	(15.6)	3	(0.9)	30
CT indicates Critical Thinking.											

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survey statement “I have the skills sufficient to teach critical thinking.” However, it was interesting that the actual mean overall CCTST scores and subscores of those who disagreed or strongly disagreed were slightly higher than the mean scores of the participants in the other subsets. It may be that those who disagreed or strongly disagreed underestimated their own critical thinking abilities or simply wanted to allow themselves some cushion in anticipation of what their actual test results might be. It is possible that those participants who strongly disagreed or disagreed with the question of having sufficient critical thinking skills to teach did so because they did not feel that they would perform well. Conversely, it may be that those who disagreed or strongly disagreed actually had a better understanding of the concept of critical thinking which enabled them to think more globally, to see the larger picture, and to realize what might actually be involved in teaching critical thinking.

What of those participants whose self-report indicated agreement or strong agreement that they had essential critical thinking skills, only to produce lower actual CCTST scores? It is possible that, because critical thinking is not necessarily well understood, participants may have had a limited view of the skills involved, overestimated their abilities, and believed themselves to be good performers. This interpretation would find support in the aforementioned study conducted for the California Commission on Teacher Credentialing, which explored teachers’ perceptions and practices related to critical thinking. Paul et al concluded, “it appears likely that we are now training teachers who not only have little understanding of critical thinking nor how to teach for it but also wrongly and confidently think they do.”^{2(p32)}

The self-reported responses to the demographics survey were but one of the ways the critical thinking skills of AMEDDC&S instructors were addressed. The actual CCTST scores and subscores achieved provided a primary measure and were analyzed using norm-referenced interpretation. The sample was disaggregated by education level for comparison with normed scores. Table 3 presents the distribution based on the highest level of education.

Table 3. Distribution of sample based on education level.

	Frequency	Percent
High School	3	0.9
Some College	116	33.5
Associates Degree	91	26.3
Baccalaureate Degree	69	19.9
Masters Degree	34	9.8
Post-Masters	4	1.2
Doctorate	22	6.4
Post-Doctorate	5	1.4
Missing	2	0.6
Total	346	100.0

There was no single norm group against which to compare the CCTST scores of the participants in the study of AMEDDC&S instructors. Instead, Insight Assessment, the publisher and vendor of the California Critical Thinking Skills Test, provided 2 separate sets of norm scores based on highest level of education: one was a 2-year college group based on scores of 729 students, and the other was a 4-year college group developed from scores of 2677 students. There were no norm scores available for graduate levels or advanced degrees at either the masters or doctoral levels.

Because the education levels of the subjects in this study ranged from high school to post-doctorate, the data were recoded into 4 subsets for analysis. Level one included scores originally designated high school, some college, and associates degree, and it was coded Some College. Level two, coded Baccalaureate, was unchanged. Level three, coded Masters, included both masters and post-masters, and level four, coded Doctorate, included both doctorate and post-doctorate. This allowed for the CCTST mean scores of those in this study with education levels equal to or less than an associates degree to be compared to the mean scores of the 2-year norm group. The CCTST mean scores of those holding a baccalaureate degree were compared to the scores of the 4-year norm group.

Comparison with 2-year norm group. Two hundred ten (61%) of the participants in the AMEDDC&S instructor sample reported an education level equal to or less than 2 years of college. Mean scores of the 2 groups were very similar and *t* tests revealed no significant differences between the mean scores of the sample population and the mean scores of the norm group (Table 4). Therefore, one may infer that the critical thinking skills of the AMEDDC&S instructors with some college equal to or less than a 2-year associates degree and the skills of the 2-year college students were the same.

Comparison with 4-year norm group. Sixty-nine (20%) of the AMEDDC&S instructor sample reported their highest level of education as the baccalaureate degree. Their scores were compared with norm scores of 2,677

Table 4. Descriptive statistics of overall CCTST scores and subscores comparison to the 2-year college norm group (n=20).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Sample	210	14.71	4.452	4.03	1.470	6.77	2.337	14.71	4.452	8.84	2.611	5.87	2.565
Norm Group	729	14.75	4.922	4.13	1.491	6.80	2.632	14.75	4.922	8.60	2.787	6.14	2.837

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

Table 5. Descriptive statistics of overall CCTST scores and subscores comparison to the 4-year norm group (n=69).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Subjects	69	15.65	5.387	4.38	1.446	7.10	2.739	4.17	2.242	9.20	2.978	6.45	3.183
Norm Group	2677	16.80	5.062	4.44	1.408	7.85	2.684	4.52	2.143	9.53	2.821	7.27	2.889

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

Table 6. Descriptive statistics of overall CCTST scores and subscores of instructors compared by education levels (n=346).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Some College	210	14.71	4.452	4.03	1.470	6.77	2.337	3.91	1.877	8.84	2.611	5.87	2.565
Baccalaureate	69	15.65	5.387	4.38	1.446	7.10	2.739	4.17	2.242	9.20	2.978	6.45	3.183
Masters	38	17.55	5.411	4.61	1.443	8.16	2.805	4.79	2.642	10.24	2.889	7.32	2.960
Doctoral	27	23.22	3.876	5.59	0.844	10.41	2.454	7.22	1.672	12.67	1.732	10.56	2.819
Missing	2												
Totals	346	15.88	5.247	4.28	1.483	7.27	2.673	4.32	2.214	9.37	2.856	6.51	3.029

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

4-year college students (Table 5). Again, because there were no instructor norms available, the 4-year college group was considered to be representative of a peer group. In this case, the *t* tests revealed statistically significant differences in critical thinking skill levels in the areas of inference and deductive thinking. Further, in all areas, the 4-year college students had higher mean scores than the mean scores of the AMEDDC&S instructor sample in the Baccalaureate group.

One might reasonably ask why it is that college students demonstrated significantly higher levels of certain critical thinking skills than military instructors with equal numbers of educational credits in addition to several years of military experience. The answer may lie in the instructors' own military training backgrounds. It may be that in a structured military training environment, a focus on discreet tasks and technical content framed within specialty areas actually becomes a limiting factor with regard to critical thinking.

Both Kegan⁹ and Brookfield¹⁰ asserted that transformative learning through critical thinking/reflection is not necessarily a goal for all instruction, and that all reflection is not necessarily critical or transformative. Kegan acknowledged differences between transformational and informational learning. Because it deepens or adds to understanding, informational learning may be appropriate for the theory, concepts, principles, and procedures associated with the specificity of military tasks and training.

Finally, with regard to the norm-referenced interpretation of the mean CCTST scores of the Some College and Baccalaureate subsets, it may be important to note that all mean scores of the Baccalaureate subset were higher than the mean scores of the Some College subset (Table 6). This might suggest that there was evidence of some increased cognitive development for those 2 additional years of higher education. This finding is similar to

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that of Pascarella¹¹ who reported modest gains in critical thinking abilities for students attending college over students who did not.

Although there were no norm group scores available for those participants in the study who hold advanced degrees, the mean overall CCTST scores and subscores of AMEDDC&S instructors were compared by education levels among and within the 4 subsets, with some surprising results (Table 6). While one might intuitively expect that increasingly higher levels of educational experience would yield higher levels of critical thinking skills, the results of a one-way ANOVA related to the masters degree indicated only one area of significant difference. The means of the overall CCTST scores of those with masters' degrees were significantly higher than were the means of the overall scores of those in the 2-year subset. However, with regard to a comparison of the means of all the CCTST subscores, there were no significant differences among those instructors reporting a master's degree as their highest level of education, those with some college, or those with a baccalaureate degree. Perhaps not so surprising, those with doctorates as their highest level of education had statistically significant higher CCTST scores and all subscores than any of the other participants across all 4 education level subsets.

Given the challenges and academic rigor associated with advanced doctoral level programs, these results are not unexpected. There is an expectation that those who have earned advanced degrees in a discipline have learned the skills of critical thinking in the process.¹² Onwuegbuzie¹³ compared masters and doctoral-level students using the CCTST which revealed significantly higher critical thinking scores for doctoral students. Nonetheless, doctoral level results aside, the critical thinking skill comparison of those in the Masters subset as indicated by their overall CCTST scores and subscores and those in the Some College and Baccalaureate subsets do raise some questions regarding the nature of their graduate degrees.

Through the Defense Activity for Nontraditional Education Support and the Service members Opportunity Colleges Army Degree (SOCAD) program, military personnel may be given college credit for their military training and/or experience. The

Military Evaluation Program, under the auspices of the American Council of Education (ACE), also evaluates military occupational training and publishes credit recommendations in the *Guide to the Evaluation of Educational Experiences in the Armed Services* (ACE Guide, available at <http://militaryguides.acenet.edu/>) which serves as a reference to over 3,000 colleges and universities in addition to the SOCAD network.¹⁴

There were no data collected to indicate the source of academic degrees held by the AMEDDC&S instructors, and, while the comparisons of the participants in the study sample with the norm groups were considered to be appropriate, it was not assumed that credit awarded for military or life-experience represents the same academic experience as that of matriculated students at a college or university. In the former cases there is, in effect, the equivalent of a "training avoidance" not unlike a cost avoidance that occurs when the requirement for an expenditure is eliminated. When individuals are given credit for training they have already had, they do not accrue any benefits that would be derived from additional learning or development. There are also many distance-learning opportunities afforded to the military through programs like eArmyU* for example. Because courses are offered by a number of institutions, there may not be a consistent philosophy or program of developmental progression which one might expect to find in a traditional 4-year program. Rather, degree plans and programs may be cobbled together out of disparate experiences and training that satisfy administrative requirements, but may not serve to enhance critical thinking skills.

Ironically, civilian educational institutions have also been confronted with issues similar to those noted above:

In the absence of shared learning goals and clear expectations, a college degree more frequently certifies completion of disconnected fragments than [that] of a coherent plan for student accomplishment.¹⁵

Weingartner observed that ends and means are often confused, and courses, rather than the learning, are considered to be the goal:

We require what we believe students need, what they cannot do without; fulfilling requirements, however, soon becomes the whole of education.¹⁶

*eArmyU is an Army online learning portal which provides access for Soldiers to over 100 degree plans at regionally-accredited colleges and universities. Information available at https://www.goarmy.com/public/public_earmyu-about_earmyu.aspx.

With regard to the value of the baccalaureate degree, the Council for Higher Accreditation (among others) reaffirms the importance of a liberal education in assuring that students are developing the capacity to think and obtaining knowledge necessary to prepare for the future. Indeed, an impetus for this study emerged as a result of the increasing emphasis on critical thinking skills as a component of military education.

Hypothesis 2: There are differences in the level of critical thinking skills of officer and noncommissioned officer instructors.

Because the sample population was naturally segregated into 3 distinct groups of participants, null Hypothesis 2 investigated the critical thinking skill levels not only of instructors who were officers and those who were NCOs, but also of those who were civilians, using an ANOVA procedure (Table 7). The levels of significance for the mean overall CCTST scores and all subscores were 0.000. The Scheffe post hoc analysis indicated the officer instructor group was significantly different from the others and had higher levels of critical thinking scores than did both the NCO and civilian instructors. There was no significant difference between the scores of the civilian and NCO instructors.

In light of the literature which addressed the dominance of the professional officer subculture, perhaps these results are not surprising.¹⁷ Further, the Center for Strategic and International Study Group on Professional Military Education, which focused exclusively on officer education, emphasized increasing intellectual demands.¹⁸ Their recommendations for increased academic education and advanced degrees, particularly in civilian institutions, would be supported by the results of this study. Based on the previous discussion of education levels, the number of advanced degrees held by the officer subset of AMEDDC&S instructors must certainly be regarded as one explanation for the differences. Officer instructors held 43% of the masters' degrees and 92% of the doctorates represented in this study. Conversely, the NCO (87%) and civilian (12%) instructors represented nearly the entirety of those instructors who populated the Some College subset.

The majority of the instructors at the AMEDDC&S are NCOs. Because the results of this study indicated significant differences between the mean CCTST scores and subscores of officers and NCOs, the training and education of NCOs should be considered. It may be that a focus on the training of individual tasks to established standards either limits or precludes the critical reflection necessary for integrated transformative learning. In many respects, NCO training has been conducted from a fairly linear approach, characterized by performance checklists and algorithms and is usually taught in a step-by-step format described as "crawl, walk, run." It may be that these training processes are entirely appropriate, given the ever-increasing demands for the initial training of both warrior skills and medical skills and reactions for the contemporary operational environment.* It may be desirable that these medical Soldiers first develop their skills to the level of automaticity. Subsequently, however, it is possible that with increasing implementation of scenario-based training, more explicit training for critical thinking will be realized.

Hypothesis 3: There are differences in the level of critical thinking skills of instructors teaching leadership courses and those who teach a technical medical specialty.

The comparison of mean overall CCTST scores and subscores of those who taught leadership courses and those of medical specialty instructors yielded no significant results (Table 8). It should be noted that mean scores of officer, NCO, and civilian instructors were all included in this comparison. Because officers were often responsible for curriculum development, served as course directors, and, in fact, taught some of the military occupational specialty (MOS) courses, their scores were included in the data analysis. The scores of civilian instructors were also included because they also have teaching responsibilities along with those NCO instructors who hold the MOS.

Of note is the fact that the leadership subset was populated by only 13 subjects. A future study having greater participation of leadership instructors from both the Officer Education System and the Noncommissioned Officer Education System would obviously provide more valuable results.

*The operational environment that exists today and for the clearly foreseeable future. An operational environment is defined in DoD *Joint Publication 1-02*¹⁹ as "a composite of the conditions, circumstances, and influences that affect the employment of military forces and bear on the decisions of the unit commander."

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Table 7. Descriptive Statistics of Overall CCTST Scores and Subscores Compared by Instructor Status: Officer, NCO, and Civilian (n = 346).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Officer	51	20.53	5.201	5.06	1.318	9.45	2.633	6.02	2.396	11.43	2.594	9.10	3.195
NCO	248	15.18	4.613	4.13	1.454	7.01	2.378	4.04	1.998	9.06	2.630	6.12	2.717
Civilian	47	14.45	5.785	4.28	1.542	6.26	2.967	3.91	2.283	8.74	3.287	5.70	3.035
Total	346	15.87	5.239	4.29	1.479	7.27	2.668	4.32	2.211	9.37	2.849	6.50	3.031

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

Table 8. Descriptive Statistics for the Overall CCTST Scores and Subscores of Instructors of Leadership and of Medical Skills (n = 346)

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Leadership	13	17.38	5.331	4.38	2.022	8.38	2.599	4.62	2.022	10.38	1.938	7.00	3.786
Medical Skills	323	15.84	5.219	4.27	1.457	7.25	2.659	4.32	2.216	9.34	2.849	6.50	3.016
Missing	10												
Total	346												

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

Hypothesis 4: There are differences in levels of critical thinking skills among instructors teaching in the various medical military occupational specialties.

Statistically significant differences were found in only 2 instances when the mean overall CCTST scores and subscores of instructors in 9 medical military occupational specialties were compared (Table 9). In one case, overall CCTST scores of radiology specialists were higher than those of the practical nurses, while the mean scores of the other MOSs resulted in no difference. In the second case, the mean CCTST induction subscores of the veterinary food inspection specialists were higher than those of the practical nurses, while the mean scores of the remaining MOSs indicated they were statistically the same.

One possible explanation for the differences may be that 25% of the radiology specialists had highest education levels equal to or higher than a baccalaureate degree, whereas the highest education levels of the veterinary food inspectors and practical nurses equal to or higher than a baccalaureate degree were 10% and 6% respectively. Preliminary qualifications for military occupational specialties are determined by scores on the Armed Forces Vocational Aptitude Battery (ASVAB) which is the official mental testing battery used by all US armed services. Groups of ASVAB subtest scores are combined into

composite line scores, the most important of which for the majority of the medical enlisted specialties is the Skilled Technical (ST) score, a composite of subtests of general science, word knowledge, paragraph comprehension, mechanical comprehension, and mathematics knowledge. The ST requirements for the radiology specialist (MOS 91P), the veterinary food inspection specialist (MOS 91R), and the practical nurse (MOS 91WM6) are 110, 100, and 101 respectively. If the skilled technical score were indicative of actual critical thinking skills, the results of this comparison might have been anticipated, although a review of the literature indicated that critical thinking is not the same as intelligence, in that critical thinking involves specific skills and disposition.^{1,20-22}

Therefore, although the ST scores may be an indication of the mental abilities or cognitive skills required for each MOS, a more complete explanation for differences in critical thinking skill levels may be realized only after further study to examine the differences among the course content and the training processes for all 3 groups. Both the radiology specialists and the veterinary food specialists reported having a great deal of ownership and responsibility for the curriculum and development of their courses. Their branches are fairly small, and content in their courses is challenging and well integrated.

Table 9. Descriptive statistics for Overall CCTST scores and subscores comparisons of instructors by MOS (n = 346)

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Radiology Specialist	12	16.92	3.554	4.75	0.965	8.25	2.137	3.92	1.975	9.83	2.209	7.08	2.539
Veterinary Food Inspection Specialist	10	16.90	4.725	4.70	1.494	7.80	1.989	4.40	2.459	9.90	2.514	7.00	2.828
Medical Laboratory Specialist	52	16.73	4.703	4.25	1.440	7.60	2.345	4.88	1.957	9.87	2.552	6.87	2.822
Preventive Medicine Specialist	13	16.31	4.270	4.46	1.391	7.62	1.981	4.23	2.488	9.77	1.787	6.54	2.847
Mental Health Specialist	19	15.47	4.683	4.47	1.349	6.89	2.536	4.11	2.052	9.42	3.288	6.05	2.345
Preventive Dentistry Specialist	13	14.54	4.075	3.62	1.557	7.15	2.703	3.77	1.641	9.38	2.181	5.15	2.444
Health Care Specialist	58	13.88	4.967	3.81	1.561	6.50	2.515	3.57	2.010	8.22	2.740	5.66	2.911
Hospital Food Service Specialist	10	13.30	3.713	4.00	0.667	5.90	2.234	3.40	1.776	8.00	2.211	5.30	2.359
Practical Nurse	16	13.06	3.435	3.38	1.628	6.25	1.770	3.44	1.590	7.69	1.922	5.38	2.500
Totals	203	15.19	4.671	4.09	1.466	7.05	2.390	4.05	2.032	9.05	2.633	6.14	2.756

CCTST indicates California Critical Thinking Skills Test. MOS indicates military occupational specialty. M indicates mean. SD indicates standard deviation.

On the other hand, it should be noted that the practical nurses participating in this study were among nearly 300 instructors responsible for training of the healthcare specialists (MOS 91W) in the Department of Combat Medic Training. Instruction is modularized, and instructors do not necessarily have responsibility for curriculum development. This situation may be like those which gave rise to observations regarding undeveloped intellectual capital within an organization when individuals do not have responsibility for either training development or decisions related to the intellectual development of their students.^{23,24} There may not be opportunity for intellectual development or challenge for instructors as well. It may also be that the differences in numbers of instructors in small versus large departments impact the culture of their teaching organization and further influences perceptions of individual intellectual investment. Theirs may necessarily be a function of “instructor as messenger” rather than that of instructor/training developer.²⁵

The AMEDDC&S is organized into teaching departments based on specialty areas which include the related MOSs. Therefore, another measure of instructor skills in specialty areas involved a comparison of overall mean CCTST scores and subscores across all departments, and included officer, civilian, and NCO instructors. Only departments having 10 or more participants were included in this comparison. Statistically significant differences were found in all instances when the mean overall CCTST

scores and subscores of instructors in 9 teaching departments were compared using a one-way ANOVA (Table 10). The instructors of the Department of Veterinary Sciences (DVS) scored higher overall CCTST scores and inference subscores than did the instructors in both the Department of Health Services Administration (DHSA) and the Department of Combat Medic Training (DCMT). In addition, the DVS instructors had higher analysis and deductive thinking subscores than did the DCMT instructors, as well as higher evaluation and inductive thinking subscores than did the instructors in the DHSA.

Based on the earlier discussions of Hypotheses 1 and 2 which found significant differences between overall CCTST scores and subscores of officer and enlisted instructors as well as significant differences associated with advanced degrees at the doctoral level, the differences of critical thinking skill levels within departments might simply be explained by the fact that 36% of the DVS participants were officers, compared with 10% and 5.4% officer representation for DHSA and DCMT respectively. Additionally, the highest level of education equal to or greater than the doctoral level were held by 24% of the subjects representing the DVS, by 5% of the subjects from the DHSA, and 0% from the DCMT. Therefore, the differences in overall CCTST scores and subscores among instructors in the AMEDDC&S teaching departments could be attributed to their rank and their highest levels of education.

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Table 10. Descriptive statistics of overall CCTST scores and subscore comparisons of instructors by teaching departments (n = 346).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Combat Medic Training	75	13.31	4.832	3.72	1.547	6.03	2.371	3.56	2.015	7.96	2.778	5.35	2.658
Clinical Support Services	83	16.94	4.516	4.45	1.373	7.78	2.353	4.71	2.027	10.02	2.434	6.92	2.786
Dental Sciences	26	15.50	4.752	4.27	1.687	6.85	2.679	4.38	1.899	9.88	2.215	5.62	3.021
Health Services Administration	21	13.29	5.159	4.00	1.378	6.19	2.822	3.10	2.143	7.76	3.254	5.52	2.502
Medical Science	52	15.90	4.860	4.31	1.229	7.35	2.504	4.25	2.239	9.06	2.697	6.85	2.933
Preventive Health Services	39	17.46	5.481	4.62	1.350	8.00	2.734	4.85	2.477	10.33	2.950	7.13	3.189
Veterinary Services	25	19.68	5.505	5.04	1.274	9.12	2.818	5.52	2.400	10.96	2.638	8.72	3.348
Leader Training Center	13	17.38	5.331	4.38	2.022	8.38	2.599	4.62	2.022	10.38	1.938	7.00	3.789
Other	10	15.00	5.944	4.80	1.476	6.30	2.830	3.90	2.424	9.10	3.755	5.90	2.601
Missing	2												
Totals	346	15.88	5.252	4.30	1.473	7.27	2.676	4.31	2.217	9.37	2.855	6.51	3.029

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

On the other hand, those who, like McPeck²⁶ and Gardner,²⁰ espouse a domain-specific paradigm of critical thinking, would argue that an analysis of professional knowledge, skill sets, and competencies required for the specialties within each department might better inform an interpretation of the results.

Military Experience. The last 2 hypotheses in this study were addressed by 3 different examinations involving participants' military assignment background, military deployment experience, and years of service. These examinations provided surprisingly similar results. No statistically significant differences were found in comparisons of mean CCTST scores and subscores of instructors by ranges of years of total military service; nor were there differences when types of assignments were compared. Types of military assignment backgrounds were categorized as: (a) primarily Table of Distribution and Allowances (TDA)–to organizations characterized as primarily “institutional,” because they are defined by TDAs; (b) primarily Table of Organization and Equipment (TOE)–to organizations characterized as “operational,” because they are defined by TOEs; and (c) “both”–background which included TOE as well as TDA assignments. The data is presented in Tables 11 and 12. Finally, in a comparison of types of deployment experience, there were no significant differences found except in the means of CCTST analysis subscores of officers (Tables 13 and 14).

Hypothesis 5: There are differences in the level of critical thinking skills of instructors with a TOE background, those who have primarily a TDA background, and those who have experience in both types of assignments.

The results of the ANOVA indicated no significant difference found. However, it was interesting to note that in both the officer and NCO subsets, actual mean overall CCTST scores and subscores were highest for those instructors having had only TDA assignments. It is possible that the nature of unit training requirements and exercises in an operational TOE environment may somehow limit an individual's range of decision-making or problem-solving requirements. This may be especially true when compared with the AMEDD institutional TDA environment in terms of the broad scope of research and medical treatment practiced in Army Medical Centers and teaching hospitals. The potential for more numerous opportunities for further training and continuing education afforded in a TDA assignment should also not be discounted.

Hypothesis 6: There are differences in the level of critical thinking skills of instructors who have combat experience, humanitarian deployment experience, those who have both, and those who have had neither type of experience.

When comparisons of critical thinking skill levels were based on instructors' deployment experience, the only statistically significant difference indicated that the mean CCTST analysis subscores were highest for

Table 11. Descriptive statistics of overall score and subscore comparison of officer instructors by assignment background (n=51).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
TDA	14	22.36	3.319	5.36	7.45	10.21	2.259	6.79	2.045	12.21	1.672	10.14	2.214
Both	34	19.65	5.645	4.94	1.455	9.15	2.743	5.56	2.452	11.03	2.876	8.62	3.438
Missing	3												
Total	48	20.44	5.194	5.06	1.295	9.46	2.633	5.92	2.386	11.38	2.623	9.06	3.185

M indicates mean. SD indicates standard deviation.

Table 12. Descriptive statistics of overall CCTST score and subscore comparisons of NCO instructors by assignment background (n=248).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
TDA	26	16.85	4.211	4.62	1.444	7.38	2.368	4.85	1.826	9.88	2.142	6.96	2.891
TOE	14	15.36	5.183	3.71	1.069	7.29	2.758	4.36	2.023	9.14	2.983	6.21	2.833
Both	204	15.01	4.577	4.09	1.468	6.99	2.339	3.93	1.991	8.99	2.628	6.02	2.693
Missing	4												
Totals	244	15.23	4.591	4.13	1.453	7.05	2.361	4.05	1.990	9.09	2.606	6.13	2.726

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

those officers who had neither combat nor humanitarian deployment experience. In all other instances, the overall CCTST scores and subscores for both officer and NCO instructors, when compared within their respective subsets, were statistically the same regardless of their deployment experience. The actual mean overall CCTST scores and subscores for both officers and NCOs followed similar patterns, with the instructors who have had neither combat nor humanitarian deployment experience having the highest scores in a majority of cases. These results were not inconsistent with the comparisons of TOE and TDA background experience since combat and humanitarian or peacekeeping deployments may be most closely associated with TOE assignments, ie, the operational Army. Likewise, it was not unreasonable to associate those instructors having had no deployment experience with TDA assignments, ie, the institutional Army.

With regard to the issue of combat experience, it should be noted that those in this study of AMEDDC&S instructors who indicated having combat experience were for the most part referring to Desert Shield/Desert Storm of 1991. Since then, and particularly beginning in 2000 with the Army Training and Leader Development Panels, there has been significant study of the Army profession. There has

also been considerable study of the differences in the nature of current combat experience in Afghanistan and Iraq from previous combat and the development of expert knowledge. Snider pointed to the number of rotations of soldiers to the Middle East with the observation that "...students at Leavenworth now know more than their faculty."²⁷ In his study of combat experience of junior officers in Afghanistan and Iraq, Wong describes a cohort of "innovative, confident, and adaptable" lieutenants and captains who have learned to "...actually lead and make decisions rather than merely to execute the orders of higher commands."^{28(p13)} It is important to consider whether those lessons learned reflected enhanced critical thinking abilities. It may be that critical thinking skills of AMEDDC&S instructors more recently returned from combat deployment would differ from those who participated in this study. Only further research could determine if such is the case.

While it was not possible to compare results of this study to other specific research of military medical instructors' critical thinking skills, the effects of education on the development of critical thinking abilities could be corroborated. In a 1997 study conducted at the Center for Creative Leadership in Greensboro, NC, Duchesne examined "how

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Table 13. Descriptive statistics of overall CCTST score and subscore comparisons of officer instructors by deployment experience (n=51).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Humanitarian	19	22.00	3.496	5.32	.749	10.21	1.932	6.47	1.867	12.16	1.708	9.84	2.387
Both	11	19.09	5.558	4.27	1.618	8.82	2.960	6.00	2.191	11.00	2.324	8.09	3.700
Neither	14	21.79	4.492	5.64	0.929	9.64	2.818	6.50	2.139	11.86	2.413	9.93	2.947
Missing	14												
Totals	51	21.20	4.465	5.16	1.180	9.68	2.513	6.36	2.001	11.77	2.112	9.43	2.968

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

Table 14. Descriptive statistics of overall CCTST score and subscore comparison of NCO instructors by deployment experience (n=248).

Group	n	Overall		Analysis		Inference		Evaluation		Induction		Deduction	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Combat	31	13.77	4.417	3.68	1.681	6.55	2.188	3.55	1.670	8.35	2.374	5.42	2.826
Humanitarian	84	15.48	4.419	4.14	1.381	7.21	2.298	4.12	2.008	9.30	2.592	6.18	2.580
Both	54	15.19	4.589	4.02	1.236	7.20	2.358	3.96	2.282	9.04	2.642	6.15	2.818
Neither	78	15.53	4.821	4.37	1.555	6.92	2.475	4.23	1.893	9.19	2.683	6.33	2.762
Missing	1												
Totals	248	15.21	4.593	4.13	1.456	7.04	2.352	4.05	1.997	9.09	2.607	6.13	2.719

CCTST indicates California Critical Thinking Skills Test. M indicates mean. SD indicates standard deviation.

developmental learning, and adaptive flexibility relate to the level of critical thinking in sample of organizational leaders.”^{29(p1)} Duchesne identified the following variables that had been associated with critical thinking in previous research: intelligence, age, years of education, and years of experience. To this list, he added adaptive flexibility and hypothesized there would be no combination of factors that predict the level of critical thinking. An analysis of the data generated by the Watson-Glaser Critical Thinking Appraisal (Pearson Assessment Inc, San Antonio, Texas), the Background Section of the McCauley Job Challenge Profile,³⁰ and Kolb’s Adaptive Style Inventory (Experienced Based Learning Systems, Cleveland, Ohio) indicated “years of education beyond high school” to be the only significant predictor of critical thinking score^{29(p3)} From another perspective, Pascarella concluded that apart from any specific experience, it was the total integration of intellectual or cognitive development [in college] that positively influenced the development of critical thinking ability.^{11(p7)}

As noted in the literature, critical thinking is not innate; it must be learned. It must be learned in a way that is intentional and conative,³¹ and it must be

supported by a culture that values critical thinking. There are no established standards of sufficiency with regard to levels of critical thinking skills required of instructors other than an understanding that instructor skills should be higher than those of their students. Certainly, the CCTST could be administered to sample populations of various groups of AMEDDC&S students to facilitate comparisons of critical thinking skill levels with those of instructors and, where appropriate, the norm groups as well. If it is accepted that instructor scores should be higher than student scores, then efforts towards increasing instructor critical thinking skills levels should logically follow.

It is important that critical thinking be understood to involve the *quality* of one’s thinking as opposed to being more narrowly defined as decision-making, problem-solving, creative thinking, intuition, brainstorming, or “thinking outside the box.” Major General Maggart made a particularly cogent recommendation at the opening of a 2001 Army Research Institute Critical Thinking Workshop conducted at Ft Leavenworth:

...the Army is basically a process driven organization, more interested in standardization of thought than in divergent thought. Critical thinking requires divergent

thought, so as you discuss critical thinking over the next 2 days, please try to resist the urge to develop another military decision making process or a command and staff action process...If you describe critical thinking as an algorithm, that is what the Army will teach and students will learn...but unfortunately they will not learn how to think critically!³²

CONCLUSION

The purpose of this study was to measure critical thinking skills of instructors within the AMEDDC&S, in part, to establish a baseline or frame of reference for subsequent professional development and curriculum design and development, as well as other critical thinking initiatives. Many questions emerged: What will be the trends in critical thinking skill levels of instructors over the next 5 or 10 years? To what extent is the organizational culture supportive of critical thinking? What kinds of experiences impact instructor critical thinking skills? What kind of training or professional development will be required? Do enhanced critical thinking skills of instructors actually lead to greater student success? What are the characteristics of instructors of successful students? What kinds of successful student achievement data could be indicative of instructor critical thinking skills? There may not be easy answers, but it was hoped that the results of this study might provide a starting point for increased interest in collaborative efforts toward development of critical thinking skills as AMEDDC&S intellectual capital, professional development of instructors, and, ultimately, improved student performance.

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Assessment-Based Instruction

Stephanie Hamilton, MEd

*Assessing accomplishment in the cognitive domain has occupied educational psychologists for most of this century.*¹

There has long been discourse between teacher and student. What is the best way to effectively transfer data from teacher to student? More importantly, what is the best way to effectively analyze the retained data that has been transferred? In this paper, I attempt to analyze assessment-based instruction; define the key components, explore how different assessments can change instruction within the current classroom, and examine how assessments can improve curriculum and the implementation difficulties within the Academy of Health Sciences, US Army Medical Department Center and School.

Herman et al² iterate the key components of assessment-based instruction:

Note five recent trends in assessment. They are movements from (1) behavioral to cognitive views of learning and assessment, (2) paper-pencil activities to authentic assessment, (3) single-occasion assessment to samples over time (portfolios), (4) single-attribute to multidimensional assessments, and (5) near-exclusive emphasis on individual assessment to group assessment.

Essentially, in the last 20 years there has been a shift from rote education to cognitive understanding. The desire for students who can regurgitate information learned in the course has diminished, and in its place is the desire for students who can incorporate information into real life competency. The movement from pencil and paper assessments to dioramas or portfolios have helped shift education into multidimensional, multitasking assessments that create students who not only understand, but fundamentally understand the concept. Assessment-based instruction, in its pure form, uses multiple assessment types throughout the course to effectively determine the level of cognitive understanding. Replacing a singular summative assessment with multiple forms teaches to the entire class, attacks the cognitive domain from all angles and helps students “see” the connection between what is on paper and how it applies within the student’s experience.

Eldridge³ describes a study conducted with English proficiency students in which 8 cohorts of students were assessed over a 4-semester period. Four of those cohorts used summative assessments, while the other four used formative (self-assessment, peer assessment, portfolios, and cooperative learning assignments). The results of the study were that the formative assessments “were found to be no less reliable than grades calculated using purely teacher-assessed summative tasks.”³ Eldridge goes on to say:

In terms of learning, the formative cohorts demonstrated a rate of growth in proficiency that was 36% faster than the summative cohorts for listening and 3.2% faster for reading.³

The language study emphasizes that the recent trend shift from an essentially rote form of learning to a more dynamic integration only serves to improve the level of cognitive retention in students, and the demonstrated benefits of formative assessments in the classroom.

As seen in the language cohort study, the integration of multiple forms of assessment can improve learning markedly. The use of formative assessments such as self-evaluation, portfolios, and individual research questions creates an environment where the students feel more responsible for their learning. According to the Organization for Economic Cooperation and Development:

Formative assessment builds students’ “learning to learn” skills by emphasizing the process of learning, and involving students as partners in that process. It also builds students’ skills at peer-assessment and self-assessment, and helps them develop a range of effective learning strategies.⁴

In so doing, it teaches students an understanding of how they learn, and why they learn in that way. The recent shift in teaching strategies, such as the incorporation of multiple formative assessments, brings the student into focus, creating an atmosphere of mutual learning, where in the past there was only a

teacher oriented setting. The ultimate goal of educating students is to teach them how to learn, to explore and to understand their own cognitive processes—a very important step in a student's education. By learning that early and developing a solid understanding of their own cognitive processes, students are being helped not only to learn, but to develop their own lifelong learning experiences.

Implementing a formative focus into the Academy of Health Sciences will add a level of proficiency for our medically-related Soldiers. Many military occupational specialty courses use a combination of LXR tests (Logic Extension Resources Inc, Georgetown, South Carolina) and hands-on skills exams to show student proficiency, while other leadership courses use a combination of capstone exercises to demonstrate understanding. To date, one significant piece of technology being wholly underutilized is the BlackBoard (Bb) Enterprise System (Blackboard Inc, Washington, DC). LXR tests and Bb are both assisting instructors in course assessments, however, the collaborative environment is all but untouched. Within Bb, as with other learning managements systems, is the capability to ask and answer questions and to interact with instructors in an asynchronous environment. This asynchronous environment can give instructors an opportunity to view how well students are relating to the material being presented. Questions can be posed in a forum, promoting a collaborative learning environment that can aid the instructor in personalizing or redirecting instruction when necessary.

CONCLUSION

The shift from summative assessment to the incorporation of more formative assessments over the last 20 years has improved curriculum overall. In study

after study, it has been shown that the use of multiple assessment types has helped students become active stakeholders in their education, and makes them guardians of their own career progression. The key aspects to formative assessment and the integration of those key aspects has been the determinant of change in the educational world. Creating assessments that focus on cognitive interactions will create multi-dimensional students who can better integrate into an operational environment. As we develop new and better ways to teach, train, assess, and evaluate our students, we will continually improve the development of better students, and eventually a better workforce.

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If You Want to Know Why Students Fail, Just Ask Them

Self and Peer Assessments of Factors Affecting Academic Performance

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ABSTRACT

One method to discover possible reasons why individuals fail academic training is to ask them. However, self-report information can be difficult to trust, especially if students are perceived as having something to lose if they are honest. The purpose of this study was to identify potential reasons students fail (or do well) in their training as reported by 4 groups: those who failed the program (F) (n=28) and a peer (F-P) (n=28); and those who passed with a grade of B or above (P) (n=101) and one of their peers (P-P) (n=32). Statistical analysis included chi-square (χ^2) test statistics and *t* tests with a $P < .05$. Only findings considered “external” to students are included here, including class structure and schedule, instructors and teaching, support systems, and sleep. Few differences were found between peer reports and self reports by students who passed or students who failed their program. On the positive side, both P and F students indicated they could get individual attention even with large classes, having good support systems, and bonding well with their unit. On the negative side, P and F students reported difficulty staying focused during long class hours, and F students felt teaching methods made it difficult to succeed and struggled with the fast pace of the course ($P < .05$). More than half of all students reported sleeping between 5 and 6 hours per night, but those who failed more often reported sleeping only 3 to 4 hours per night ($P < .05$). These findings highlight areas of organizational strength, as well as areas of difficulty for students, which will permit administrators to set goals and perhaps tailor their programs to reduce attrition.

INTRODUCTION

Academic attrition is a challenge in all demanding education programs, regardless of the field. According to the US Army Accessions Command in 2004, academically demanding advanced individual training programs are experiencing high rates of academic attrition where many students must repeat courses or recycle into training programs. The Health Care Specialist (military occupational specialty 68W), commonly referred to as a combat medic, has been selected as the focus of this study. However, it is only one of the military occupational specialties that are experiencing high attrition and recycling.

As the changing nature of warfare yields an increasingly dispersed battlefield, the combat medic (hereinafter referred to as 68W) can be required to function while physically separated from a medical support unit. That is, they could be the only health care provider available during critical situations. The 68W will have to make independent decisions and be proficient in complex medical evaluation and

intervention techniques. All graduates from 68W training are expected to be capable of performing emergency medical and lifesaving trauma care techniques, including critical skills in trauma assessment, advanced airway and shock management, intravenous therapy, and administration of specific, limited medications. These specialists may be required to provide independent care for casualties for as long as 72 hours.

To prepare for these stringent requirements, students attend an intensive 16-week advanced individual training program at Fort Sam Houston, Texas, in the Department of Combat Medic Training facility. The first 6 weeks focus on Emergency Medical Technician (EMT) training, followed by 10 weeks of combat medic training that includes classroom lecture, interactive computer training, and patient simulation. Between 2007 and 2009, the 68W attrition rate peaked as high as 45%, but on average was 31% during that period (average pass rate of 69%) (D. Whittaker and D. P. Parsons, unpublished data, January 2010). Toward the end of 2009, the attrition rate significantly

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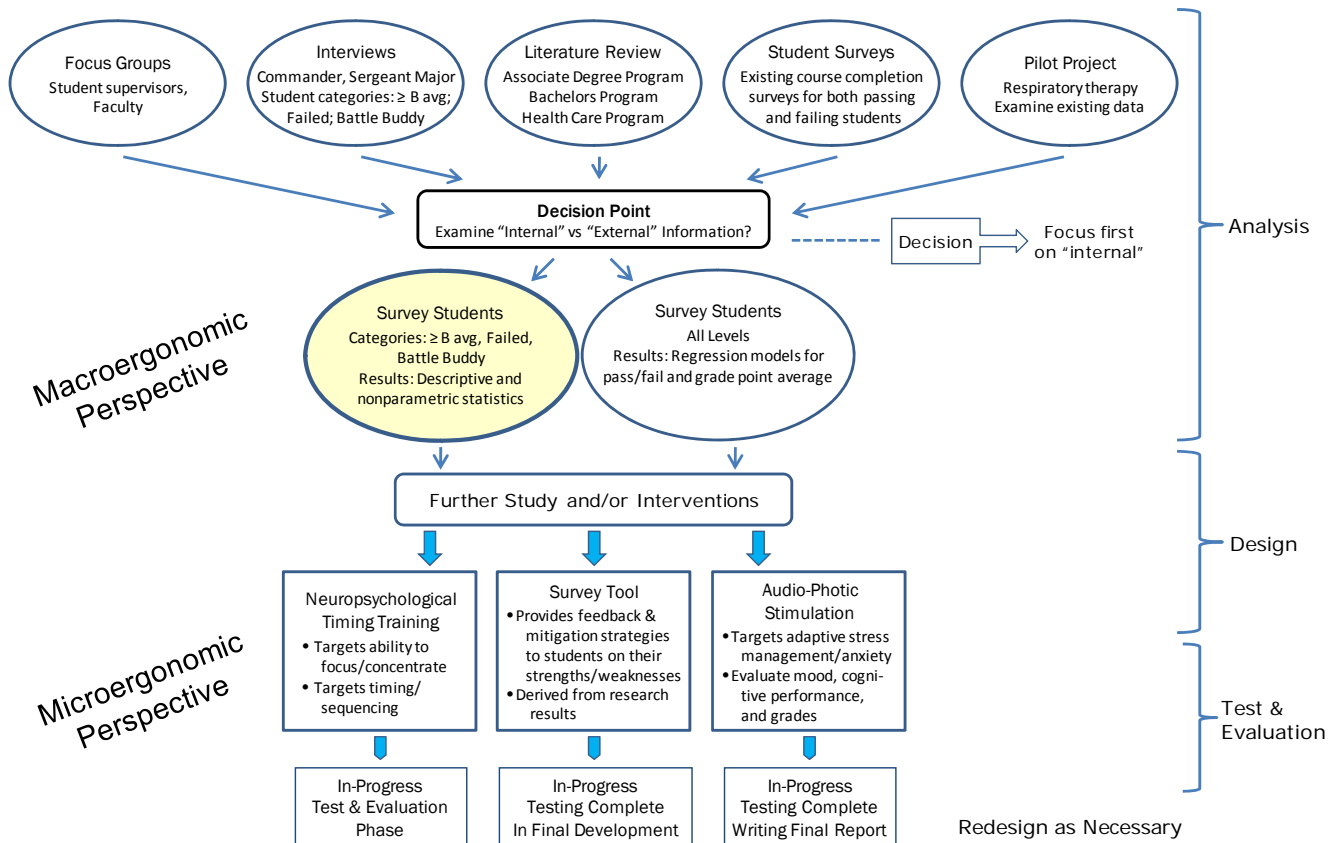


Figure 1. The Army Research Laboratory Field Element Attrition Line of Study. The highlighted section represents the focus of this study

dropped to approximately 25% after some major process changes in the 68W program (R. Brooks, written communication, March 17, 2010).

During initial focus group interviews, the 68W company commanders, drill sergeants, and academic instructors revealed their perception that approximately 50% of academic recycles are due to reasons internal to the student, including: life skills, motivation, cognitive ability, stress/resiliency/coping, inability to deal with failure, tendency to distraction, and symptoms of learning disorders. The other 50% were considered external to the student and included issues such as the program of instruction (curriculum), scheduling, selection and training of instructors, and teaching proficiency (V. J. Rice, Y. Woods, and M. Bundy, unpublished data, 2004). An open question is whether students who were successful in the course differ significantly in either their personal "internal" dimensions, or their perceptions of "external" issues from students who were not successful. This paper addresses 4 areas

considered external to the student: class structure and schedule, instructors, support systems, and sleep. Figure 1 shows the line of research conducted by the Army Research Laboratory Field Element and highlights the portion described in this paper.

Peer evaluations are often used to evaluate current performance and to predict future success among educators, law enforcement professionals, managers, medical professionals, and students. Some studies have shown that peer evaluations are better predictors of career success than evaluations by trainers or instructors.¹ Although seen less often in studies with medical students, peer evaluations have been used to:

...measure medical student achievement and predict future performance in terms of clinical competence, interpersonal skills, and professional behavior.²

Peer reviews of both clinical skills and social skills are related to later professional success in medicine (eg, referrals, hospital privileges).³

Within the 68W Advanced Individual Training (AIT) program, students are assigned a battle buddy* for the duration of the training program. During the first 72 hours following arrival at Fort Sam Houston, drill sergeants assign one student to another based on gender and basic combat training post. The program is consistent with the established US Army Training and Doctrine Command policies for enlisted training systems that includes guidance for a battle buddy system that pairs new recruits into teams to provide mutual support and assistance; teach teamwork; develop a sense of responsibility and accountability; and improve safety during training.⁴ Hence the existing battle buddy system can be employed to compare peer evaluations with self evaluations for both passing and failing students.

RESEARCH OBJECTIVE

The purpose of this study was to identify potential reasons students fail (or do well) during 68W AIT, as reported by students who failed the course, passed with a B or above, or were a friend or battle buddy of either the failing or passing cohort.

METHOD

Participants

All participants were volunteers who were currently enrolled in a 16-week 68W training program at Fort Sam Houston. Volunteers were recruited in 3 categories: (a) students who had failed the course twice, (b) students who were very successful in the course (average grade of at least a B or above), and (c) the battle buddy or friend of the unsuccessful and successful students to provide a peer evaluation. A total of 189 students (28 failing; 101 passing; and 60 peers) volunteered to participate.

Instrument

A single questionnaire was developed and then broken into two formats. The first format addressed the student (either passing or failing). The second format was used for the peer evaluations where the battle buddies were asked to complete the questionnaire as they felt was most appropriate for their buddy, ie, either a passing or failing student. Both formats asked students how they felt on a number of topic areas, including motivation, sleeping patterns, study habits, stress perception, coping strategies, learning

disabilities, health status, leadership abilities, unit cohesion, morale, indices of family status, demographics, and other situational and organizational factors that may contribute to attrition. The questionnaire included a number of statements that the students were asked to rate on a 5-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree). Students were also asked to participate in an interview, but interview results are not included here. This paper reports only responses for the external factors, eg, class structure, teaching, support systems, sleep, etc.

Procedure

Students were briefed on the protocol and the voluntary nature of the study. If interested, they were asked to sign a volunteer consent form, after which they completed the questionnaire and an interview. Each student volunteer, whether passing or failing, was also asked to consent to the researchers giving a questionnaire to their battle buddy, or another trusted friend. The battle buddy or friend was instructed to complete the questionnaire as it applied to the volunteer, not themselves. All research complied with the human use guidelines of *Army Regulation 70-25*.⁵

Analysis

The first comparison was to contrast responses from failing students and passing students to 5-point Likert scale questions. Responses for each question were compressed into 3 categories (strongly agree and agree, neutral, strongly disagree and disagree). The resulting 2 by 3 matrix was analyzed with a χ^2 test. To analyze the peer evaluations, the questionnaires (35 for passing students and 25 for failing students) were matched (eg, the study volunteer and his/her battle buddy) and the difference between them analyzed with a *t* test to determine whether the difference varied significantly from zero. The Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois) was used for all analyses with a significance level of $P=.05$.

RESULTS

The results summarized here are for the external factors included in the extensive questionnaire. Positive results (strengths of the program) are presented first, followed by areas identified as difficulties.

If You Want to Know Why Students Fail, Just Ask Them

Participants

A total of 189 students volunteered to participate; 28 failing and 101 passing students and 60 battle buddies (25 peers for the failing students and 35 for the passing students). The students were predominately Caucasian (78%), with the remainder comprised of 8% African American, 8% Hispanic, and 6% identified as other. The gender composition across groups was comparable, with male students comprising approximately three-quarters of the students (79%, 72%, and 82% for failing, passing, and battle buddy, respectively). However, the female students were younger than the male students (average age 22.4 years (female), 24.7 years (male)). The failing students were younger than passing students and the peers (average age 23.0 years, 24.7 years, and 23.8 years, respectively). Half of the students (50.0% of failing and 52.0% of passing) reported that they had studied at the college level, ie, they checked either “some college” or “college diploma” levels. However, more passing students reported having college diplomas than did failing students (16.0% and 7.1%, respectively).

Class Structure and Schedule

When asked whether the class sizes were too large to allow for individual attention, only one in 8 students (13% passing and 14% failing) agreed with that statement. Two-thirds of the students (66% passing and 61% failing) did not feel that class size prevented individual attention. Students also agreed (50% passing and 43% failing) that it is difficult to stay focused because the class days are too long. The students differed, not surprising, when asked whether they struggled with the fast pace of the course. Significantly more failing than passing students (57% and 19%, respectively) agreed that they struggled with the fast pace of the course ($\chi^2 = 16.48$, $P < .01$). Although not significant, more failing students tended to agree that there was not enough tutoring or mentoring available during the class (29% failing vs 20% passing students). The consolidated results are presented in the Table.

Sleep Patterns

There were no positive self-reports in regard to sleep. More than half of the students (57% of failing students, 67% of passing students) reported getting 5 to 6 hours of sleep each night (Figure 2).

Percentage of students (categorized by those either passing or failing coursework) who agreed with statements describing possible negative circumstances attributable to class structure and schedule conditions.

Statement	Failing Students	Passing Students
Class size too large	14%	13%
Class size did not prevent individual attention	61%	66%
Difficult to stay focused with long class days	43%	50%
Had to struggle with the fast pace*	57%	19%
Tutoring and mentoring inadequate	29%	20%

*Significant at $P < .01$

A larger difference was seen when 43% of the failing students reported they were getting only 3 to 4 hours of sleep each night, as compared with 23% of the passing students.

However, when asked whether they get enough sleep, 33% of the failing students and 17% of the passing students report that they “seldom” or “never” get enough sleep at night. Consistently, more failing students than passing students (29% vs 16%) report that they “always” or “often” stay up and study after “lights out.” Fifty-eight failing students and 37% of passing students report that they “always” or “often” have trouble staying awake in class (Figure 3). Battle buddies of passing students believed the passing students had less trouble staying awake in class (that is, they felt the passing students were able to stay

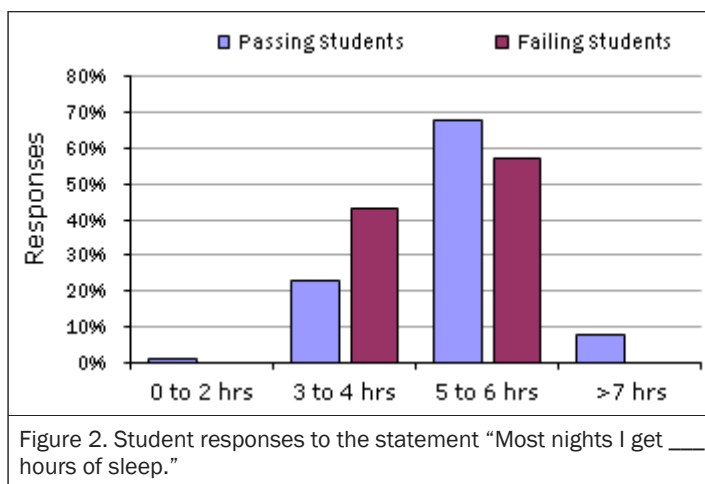
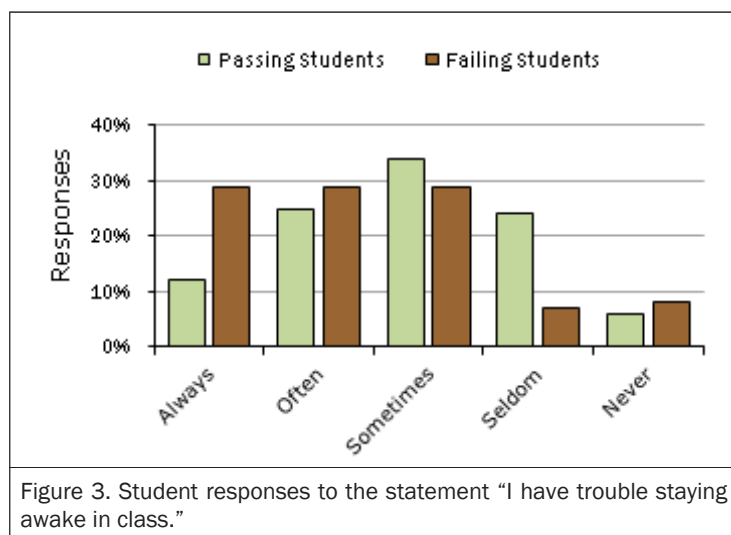


Figure 2. Student responses to the statement “Most nights I get ___ hours of sleep.”



awake more easily than the passing students themselves believed) ($P < .05$).

Instructors (including Drill Sergeants) and Teaching

Two out of 5 students (46% passing and 43% failing) reported that instructors were easily understood and taught at the appropriate level. When asked to comment on the teaching methods, significantly more failing students than passing students (54% and 25%, respectively) agreed that the teaching methods made it difficult to succeed. In the peer evaluations for this question, there was a significant difference in the response from the passing student and the response of the individual's battle buddy. The peer evaluations underestimated the difficulty that the passing students were having with the teaching methods. In fact, significantly more passing than failing students (37% vs 21%) reported that adjusting to new instructors frequently (as they shifted between subject areas) had a negative impact on grades ($\chi^2 = 7.24$, $P < .05$). When asked whether the drill sergeants affect a student's performance, more passing students than failing students (56% and 43%, respectively) agreed that drill sergeants affect academic performance, but this trend was not statistically significant (Figure 4).

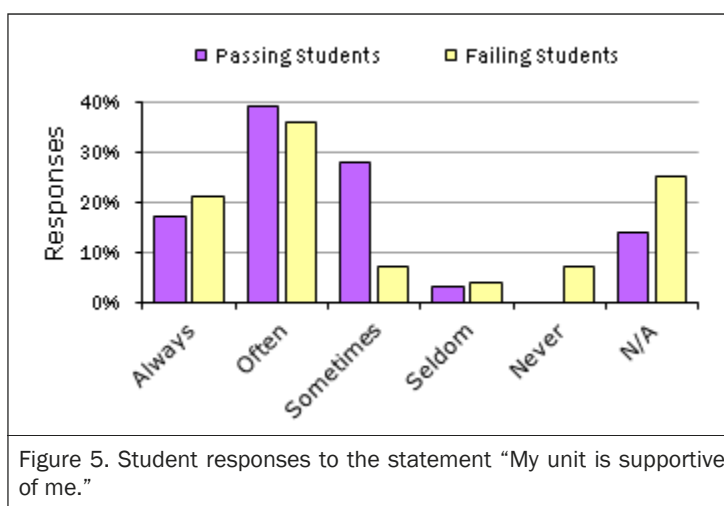
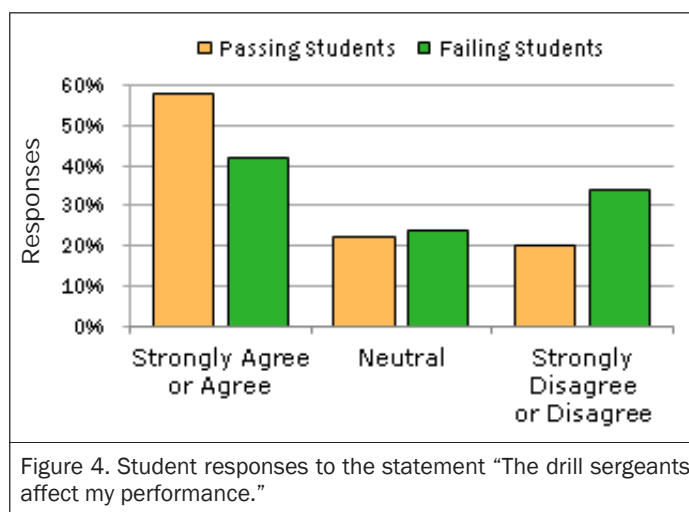
Support Systems: Unit

There were no differences between the responses from the failing and passing students when asked whether they had bonded with their

unit. More than half of the students (57% passing, 54% failing) reported that they had bonded well (Figure 5). More than half of the students (56% passing, 57% failing) reported that they felt their unit was "always" or "often" supportive of them. However, of note, a number of the students (25% failing and 14% passing) responded "N/A" to this question without further explanation.

Support Systems: Family & Friends

More than two-thirds of the students (68% passing, 71% failing) reported they had other people besides their battle buddy that they could turn to for support. Approximately 8 of 10 students (87% passing, 79% failing) reported that their family and friends were supportive and

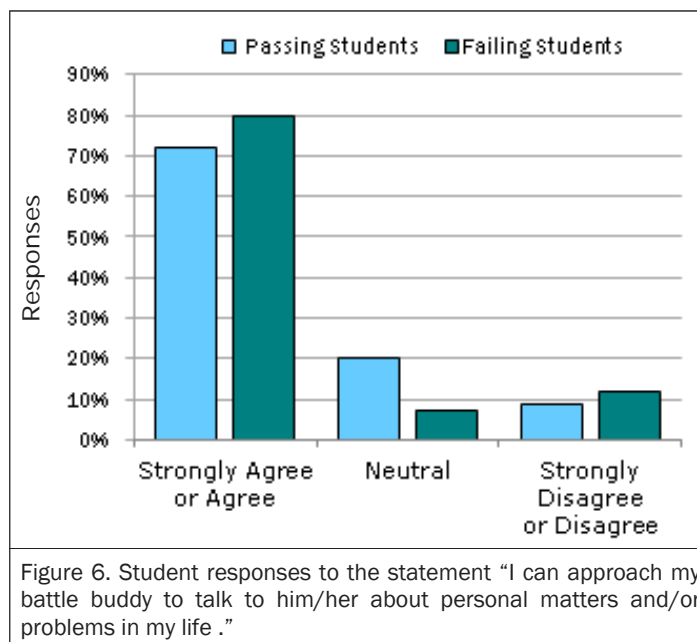


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were not pressuring them to find a way out of the course and out of the Army. However, 31% of passing students, compared with 11% of those failing, reported the wishes of their family affected their academic performance.

Support Systems: Battle Buddy

In addition to reporting support from their unit and the family and friends, the majority of the students report a positive relationship with their battle buddy. Three-fourths of the students (71% passing, 79% failing students) reported that felt they could approach their battle buddy to talk about personal matters or problems (Figure 6). More than 80% of all students (82% passing, 89% failing) agreed their battle buddy provides help and is supportive of them. Two-thirds of students (60% passing, 68% failing) reported they perceived they had a "close" relationship with their battle buddy.



COMMENT

These results of the students' assessments of external factors provide insight into the some of the issues surrounding academic performance of students attending combat medic training. They offer support for some organizational programs, dispel some myths, and identify some issues.

Ask Students

First, the results suggest that students are truthful in reporting their impressions. The assumption was that students who failed the program and will be assigned to attend alternate training in a different, nonmedical military occupational specialty might have something to lose (reputation, might receive less than fair treatment in regard to their new assignment) and therefore might be less truthful on a questionnaire. Their battle buddy would not have anything to lose and therefore might be expected to be more forthright with their responses. However, no differences were seen between failing student reports and the reports from their battle buddies. In fact, the peer evaluations did not differ significantly from the corresponding student responses except when battle buddies of passing students reported more positive responses than the individuals did themselves. For example, the battle buddies reported that passing students had less trouble staying awake in class than was reported by the passing students themselves.

Class Size

Second, class sizes have more than doubled since the onset of the war on terror from an average of approximately 200 to nearly 500. This data was collected approximately in the middle of that growth period, during which time the class sizes were approximately 350 per class. The growth in class size occurred without a commensurate increase in staff (instructors and supervisors). All are concerned about the affect this has on student learning and retention, as well as on burnout of instructors. Instructors have intensified their efforts to be available to students, set up study halls and review sessions, and deliver instruction in the best way possible. During late 2006 and early 2007, students reported that they received individual attention in spite of the class size. However, a trend was noticed in the impressions of failing students that they did not receive the mentoring they needed.

Teaching Methods

Third, it is often stated anecdotally that the instruction in the 68W program is perhaps taught at too high a level. The findings that less than half of students reporting that instructors are easily understood and teaching at an appropriate level would appear to give credence to the anecdotal statements. In addition, teaching methods appear to be an issue for failing students. Given that the primary method of teaching is through lecture accompanied by PowerPoint slides and

written outlines, this issue could easily be addressed to the benefit of the students. Combining information from this study with additional research results from this population could assist in guiding improvements in teaching and presentation techniques. For example, research with this population, and with operating room technicians, revealed visual learners performed better academically than auditory learners.⁶ On the other hand, passing students felt adjusting to changing instructors was more of an issue than did failing students. It is not clear whether failing students did not see this as an issue, or were so focused on other issues of concern (such as the pace of the course) that adjusting to changing instructors was a lesser priority.

Support Systems

Fourth, support systems appear to be readily available to the majority of students, primarily through friends and relatives. Furthermore, the battle buddy system appears to be working despite the criticism that appointing a battle buddy will not guarantee friendship or support. All students reported feeling they could approach and talk with their battle buddies, and that battle buddies were supportive. This seems to occur even when the relationship is not described as close.

Other information identified in this study is not new, but does substantiate items long thought to be issues. These issues include the long hours in the classroom (from 0900 until 1630) resulting in students having difficulty focusing on the subject matter, the fast pace of the course, and the perceived negative impact of drill instructors. Drill instructors are no longer used during 68W AIT, although supervising noncommissioned officers remain.

Perhaps one of the most pertinent issues corroborated by these findings is the lack of sleep. Student grades have previously been associated with lack of sleep⁷ and abbreviated sleep times have been associated with classroom sleepiness and difficulties in concentration and focus.⁸ Sleep is important for learning and consolidation of new memories,⁹ which is the primary task for students attending AIT. While the recommended number of hours of sleep for young adults is approximately 8 to 9 hours per night, our students are getting 5 to 6 hours, and many failing students reported getting only 3 to 4 hours each night. It may be that the training program is effectively

screening out students who require an average amount of sleep for their age.

LIMITATIONS

The primary limitation to this study is the size of the population, especially the failing student population. Also, this is a unique population (students) who may not be representative of the general population.

RECOMMENDATIONS

- Use carefully constructed questionnaires and interviews to gather information on students and student perceptions of barriers to learning, as well as programs that assist learning.
- Reinvestigate the effect of class size on students, now that it has risen to approximately 450.
- Review the program of instruction, including individual lectures and presentations, for grade level.
- Review teaching methods for those considered most effective for this age and subject matter. Consider matching teaching methods with learning styles of students.
- Provide information on positive impact of the battle buddy system to incoming instructors and students. Continue this program.
- Investigate teaching methods. Give students periodic breaks in the type and style of teaching/learning throughout the day. Continue to provide study guides, outlines and other assistance to help counter the fast pace of the course. Consider lengthening the course or having at-risk students attend an early preparatory program before the course.
- Consider methods to decrease the need for students to continually adjust to changing instructors, such as increasing the uniformity of presentations or assigning instructors to remain with a class throughout their program.
- Investigate methods to increase time available to students so they can effectively study and learn their materiel, as well as get the needed amount of sleep. Educate administrators, educators, and students on the need for sleep and how adequate sleep enhances learning and memory.

If You Want to Know Why Students Fail, Just Ask Them

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Logo of the US Army Research Laboratory

Understanding the Leadership and Cultural Dimensions of Strategic Healthcare Policy-Making in Iraq

LTC Thomas S. Bundt, MS, USA

We can't solve problems by using the same kind of thinking we used when we created them.

Albert Einstein

To formulate policy that achieves our strategic ends in Iraq, we require an approach that embraces a more thorough understanding of the Middle East. More specifically, this includes an understanding of the differences in history, culture, leadership as core constructs that affect successful policy-making in this environment.¹ Speaking primarily through a medical lens, this paper includes commentary and discussion regarding strategic healthcare policy formulation and application in the Iraqi context. The end state of achieving an improved understanding of Middle Eastern systems and viable policy formulation then equates to a more effective transition in Iraq.

One key stabilization phase tenet in a theater of operations is reestablishment of essential services to support basic social structure needs (ie, specifically health care in this case).² This can ease the suffering caused by disruption to healthcare services from conflict and likewise help to strengthen the legitimacy of the presiding government (democratic or otherwise).^{3(pp4,10,36,56)} The follow-on transition to local authorities via a functional health policy assists in the sustainment of this perception. However, effective transition requires a synchronized approach between the United States Government (USG) and the Government of Iraq (GOI) leadership. Establishment of a functional health policy through leadership and cultural appreciation can lead to a more synchronized transition and promote the operation of the Iraqi healthcare system—by the Iraqis.⁴

The following discussion relays some examples and suggestions on how to achieve a more coordinated, and synchronous strategic healthcare policy. The discussion involves a review of certain healthcare system history as well as the leadership attributes and cultural awareness variables involved. Additionally,

recommendations are provided for negotiating healthcare design through leadership and cultural appreciation mechanisms in future contexts. These elements enhance USG effectiveness in addressing policy operations in stabilization and transitional phase contexts currently and in the future.^{3(ppv,viii)}

History. The first requirement in a review of the strengths and weaknesses of previous attempts at functional policy formulation is a thorough examination of history. Several examples can be gleaned in the case of Iraq through their pre-invasion management systems. The Ministry of Health (MOH) for example, operated under a severely restricted budget that did not allow for many types of care common to Western nations. Although there is a temptation to change this paradigm on the part of medical planners, one should ask whether or not a change is relevant and/or sustainable. If USG planners and policy-makers do not consider historical systems in this case, then we make the error of providing a service or infrastructure that they cannot, or will not, fully sustain.⁵ If they cannot sustain it, the population could well look at this as a failure of the present regime, thereby damaging credibility and legitimacy.⁶

One current historical element under review is the interpretation of women's health in Middle Eastern culture. Attitudes toward female centric medical requirements are religious, political and health related issues. Often without a thorough understanding of all these elements in this context, policy-makers and operators on the ground (healthcare administrators and physicians primarily) can make erroneous assumptions resulting in embarrassment to authorities and wasted efforts. While working in the Health Attachés Office in Baghdad, I encountered one such example which evolved through a request of a representative in the

USG who asked for the status of abortion clinics to be constructed in Iraq. This is not an acceptable consideration of Middle Eastern cultures. By the nature of the office (US Department of State) however, we were asked to include this in discussions with the local medical authorities.⁷ For effective policy making in this context, the role of the Department of State is not to dictate the types of issues and topics that Iraqi medical leadership should address, but to see what the Iraqis want through their own involvement and recommendations. Had the leadership on the ground not argued against this incorporation, the results of this inclusion would have degraded the success of the health policy mission and, indirectly, our national policy objectives. To avoid these shortfalls, it is critical to develop training in policy development and leadership on the ground, prior to any deployment.

Leadership Training. As one might expect, disadvantages from lack of training, experience, and political acumen from USG elements hampered initial efforts to synch overall strategic healthcare policy operations.⁸ One example of lack of leadership training from the health policy perspective was during the initial introduction of provincial reconstruction teams (PRTs). The teams were at the operational, and, in some cases, strategic effects level of policy daily and have the potential to strengthen relationships and more seamlessly transition responsibility to local authority. However, due to their lack of initial orientation and health training, they did not understand the MOH strategic plan, the cultural sensitivity for specific medical concerns, and the makeup of the overall Iraqi healthcare system. Many of the healthcare representatives on the teams were not administrators and had little knowledge of health policy formulation or negotiations. Therefore, training of these USG key positions was initiated in-country in order to use those positions as a more effective catalyst to the overall government approach in policy formulation.⁹ Improvements continued to develop over time which allowed leadership involved in negotiations to understand the plurality of paths available in healthcare policy in international contexts.

However the lack of initial training led to early ineffective policy development as USG agencies and MOH officials left negotiations with different understandings of each other's positions, and thereby executed different agendas. One example was a meeting which occurred in Baghdad in Spring 2007

between the Ministry of Defense (MOD), MOH, Multi-National Security Transition Command-Iraq, and the Health Attaché elements regarding the modeling, standardization, and implementation of a training program for Iraqi clinical staff at our military facilities in country. Although initially agreed upon in full to begin immediately, participation was nonexistent in the first attempt. Findings revealed that the Iraqis assumed we were to meet several more times and agree several more times until the implementation occurred. Different cultural norms came into play in this scenario, and agencies created to provide "seamless" coordination lost the initiative in early policy negotiations. We need to note this for future contexts and work to incorporate the lessons into our leadership training programs.

As an added challenge, the MOH leadership does not maintain positive relationships with several other ministries, and are often at odds with the separate religious affiliations. These subtleties are relevant if we expect them to *sustain* any training and resources provided as the challenges inherent in this leadership culture impede forward progression.¹⁰ Part of the rejuvenation of essential services in a country which has suffered from deteriorating infrastructure and conflict requires a concerted effort toward the analysis of healthcare systems and needs for capacity development. If they fail in this endeavor, they could miss opportunities for deliberate funding from outside agencies, including the USG, to achieve true sustainment and legitimacy. The rationale for this from the historical perspective is this element of secularism and politics. When forming policy with institutions of this type—the secular nature of the government and the underlying religious dichotomy between religious sects (ie, a multilateral dynasty between Shiite, Sunni, and Kurd)—leadership needs to consider these factors in promoting certain ministerial and governmental systems.

As an example of this secular and political impact, when the budget was laid out for MOH as late as 2007, the minister's cabinet did not include 3 provinces of the 18 provinces throughout Iraq.^{11(p424)} The 3 provinces happened to be in Kurdish dominated territory (what the Iraqis commonly referred to as Kurdistan). The Shiite dominated MOH felt that the Kurds were already adequately funded by other systems (means) outside of their purview and did not require this funding stream.^{12(p224)} Additionally, the

other Arab sects also saw the Kurds as more interested in pursuing their own sovereignty and therefore did not wish to include them in “Iraq’s” foreign aid budget. USG planners were frustrated by this and tried to rectify the situation. Unfortunately, the USG leadership did not understand the Shiite and Sunni impression of the Kurds and failed to take that factor into account in their original negotiations with MOH on the equitable distribution of foreign aid funds. The MOH contended that they should alone manage the foreign aid fund distribution without any external interference. Any interjection into this process by the USG was then viewed as paternalistic and delegitimizing to their own systems of governance.¹¹ (p426) In this case, ministerial capacity development for leadership and administrative elements was introduced but still reduced to one essential element of culture that is best characterized by Gray: “Iraq can be transformed only within its own complex cultural parameters, not in defiance of them, and then only by Iraqis.”¹³

Culture. The leadership element also correlates directly to these religious and cultural considerations. Reducing barriers to success by gaining a better understanding of the cultural differences in strategic healthcare planning is paramount. In this context, the Iraqis define healthcare (and democracy) differently than Western counterparts.¹⁴ As such, some aspects of Western-based systems had to be excluded in planning for Iraqi health policy. For example, certain managed care imperatives, insurance systems, and geriatric long-term care facilities, though all tenets of Western systems, are either vastly different or altogether nonexistent in Iraq. Even the conduct of negotiations with the Iraqis and the relevant parties should be exercised in tandem with their norms.¹¹(p424) As Gray states, “such is the enduring significance of culture.”¹³ To appropriately educate our medical practitioners and policy-makers through orientations, we must remove our Western lens and evaluate their system through Iraqi lenses.¹⁵ Lastly, not only must we take local leadership and culture into consideration in synchronizing health policy planning, we also should review our own organizational culture to promote a singular strategic medical vision within the USG.¹⁵

Recommendation. Understanding the Iraqi health care environment requires particular attention to the leadership and cultural dimensions of their society.

Many who deploy to Iraq, including me, had preconceived notions of healthcare delivery and other biases predicated on Western culture. Particular to healthcare, perhaps the simplest instructions should read, “please check your Western views at the door.”¹⁶ The essential element here is an appreciation of the subtle differences in healthcare on the international stage. USG leadership should accept Iraq’s definition and structure of a healthcare system.¹⁷ This includes an understanding of a hybrid socialized healthcare system (public in the day and private in the afternoon), no taxation system to pay for access to care, and funding through oil revenues, just to name a few.¹²(pp221-273) As such, we should enjoin host nation medical authorities into discussions on the intricacies of their system *first*, and then determine how best to address *their* shortfalls and thereby enable *their* successful approaches.

Other themes emerge in the form of leadership and cultural strategies to enable future synchronization of healthcare policy. One element is an assessment of our current leadership competency in the healthcare context.¹⁸ This will ensure the most capable and culturally versed leadership is selected for healthcare policy-making positions in these environments. Another component is forming a strategic health policy in international contexts through Middle Eastern models, to include our own leadership training and cultural adaptation.

Preparing now facilitates discussion and further introspection into these significant components of international health policy making.¹⁹ The future synchronization of health policies will then more effectively address the shortfalls of a disrupted healthcare system and could likely lead to a smoother transition to the Iraqis, as well as promote greater long-term sustainability.²⁰ A primary course of action for a predeployment phase course would be the execution of this training and open-forum discussions with previous policy-makers and other Foreign Service assets in the leadership and cultural needs of these key postings.²¹ Agencies in Iraq, as well as those providing support from stateside and other international contributions, can then accomplish their mission with a more refined roadmap via improved leadership training and cultural appreciation within our own ranks.²²

Although this article addresses only a few select segments of the training considerations for leadership

and cultural awareness, there are dozens of subcomponent categories that can only improve upon this intent. Future courses could easily incorporate the differing subjects into a readymade template to provide to participants for use in other theaters of current operations. While we continue similar missions in Afghanistan, we should take heed of these recommendations so as to avoid any parallel pitfalls or shortcomings for future operations. In his article on counterinsurgency, General Petraeus aptly quotes Lawrence:

...try not to do too much with your own hands.... Better that the Arabs do it tolerably than that you do it perfectly.²³

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The School for Advanced Military Studies: An Untapped Resource for the Army Medical Department

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Although the Army's School for Advanced Military Studies, better known as SAMS, has existed for 26 years, many within the Army Medical Department (AMEDD) do not have a full understanding of the school's curriculum, nor what the Army expects of its graduates. More important, the lack of knowledge about the school and its graduates are defining any requirements that the AMEDD has for officers trained at the school. This is evidenced by both the lack of applicants and the lack of emphasis by AMEDD senior leaders for the department to build and maintain a bench of SAMS graduates. The situation became apparent several years ago in AMEDD's response to the Army's request for SAMS planners to develop the Warrior Transition Unit concept. When the requirement for a SAMS planner was announced, there were only 7 AMEDD officers who had graduated from SAMS, only one of which was available in the national capital region. As a result, a team of non-AMEDD SAMS graduates and students from Fort Leavenworth were sent to Walter Reed to begin the planning process. This article describes the school, the expectations of its graduates, and explains the importance of SAMS graduates to the Army Medical Department.

SAMS is one of the professional military schools within the Command and General Staff College at Fort Leavenworth, Kansas. The mission of the school is to:

...educate the future leaders of our Armed Forces, our Allies, and the Interagency at the graduate level to be agile and adaptive leaders who think critically at the strategic and operational levels to solve complex ambiguous problems.¹

The school accomplishes this mission through 2 programs: the Advanced Military Studies Program (AMSP) and the Advanced Operational Arts Fellowship Study Program (AOASF).

The AMSP is typically attended as a follow-on school by majors upon completion of the Intermediate Level

Education/Advance Operational Warfighter Course (ILE/AOWC) at Fort Leavenworth. However, in 2007 this changed so that majors and junior lieutenant colonels who have completed ILE/AOWC may be accepted directly into the program from the field. Additionally, there has been a renewed emphasis on obtaining AMSP students from other US government agencies. Within the AMEDD, only Medical Service Corps officers with Area of Concentration (AOC) designations of either 70H (Health Services Plans, Operations, Intelligence, Security, Training Officer) or 70K (Health Services Materiel Officer) have been allowed to attend the AMSP. Whether officers with other AMEDD AOCs should attend AMSP should be an important topic of further discussion, but is not addressed within the scope and purpose of this paper.

The AOASF program is a 2-year fellowship program attended by promotable lieutenant colonels and colonels as a senior service college program. The first year of the program is academically focused at the strategic level, transitioning to the second year as a seminar leader for the AMSP.

The AMSP is the hallmark of the school and is what most officers understand to be SAMS. What some have perceived the AMSP to be—and what it definitely is not—is a year mastering the military decision-making process (MDMP). For those unfamiliar with MDMP, it is the Army's planning process used primarily at the tactical level. In reality, the AMSP focuses on the development of officers to operate as staff officers and commanders at the operational level through the execution of battle command.* SAMS provides selected officers a comprehensive and rigorous 12-month curriculum on how to understand complex, adaptive problems at the operational level of war so that possible solutions, campaigns, or strategies can be generated. The AMSP accomplishes this by exposing its students to a wide variety of western and eastern lexicon, philosophy,

* Battle Command is defined as the art and science of understanding, visualizing, describing, directing, leading, and assessing forces to impose the commander's will on a hostile thinking and adaptive enemy. Battle Command applies leadership to translate decisions into actions – by synchronizing forces and warfighting functions in time, space, and purpose – to accomplish missions.²

military theory, joint and service military doctrine, and cultural studies. Finally, the SAMS curriculum emphasizes the necessity to synchronize the operational plan, both within interagency functions and across the elements of national power (diplomatic, information, military, and economic). The course then teaches students how to synthesize these various, and often divergent, ideas into a coherent executable combined, joint, and/or service specific operational plan to address identified problems at the operational level. These ideas are exemplified in the school's stated outcomes of the program¹:

- Innovative leaders, willing to accept risk and to experiment
- Adaptive leaders who excel at the art of command
- Leaders who anticipate the future operational environment
- Leaders who apply critical and creative thinking skills in order to solve complex problems
- Leaders who demonstrate mastery of operational art and doctrine
- Leaders who synthesize the elements of US national power in joint, interagency, intergovernmental, and multinational operations
- Leaders who demonstrate effective communications

However, these outcomes are not realized through one year of academics alone. The follow-on utilization assignment, referred to as a "Tier One" assignment, is considered the final phase of an officer's AMSP training.³ During the utilization assignment, an AMSP graduate generally serves as a planner within a corps or division general staff. As a result, the Army's senior leaders expect officers that "are capable of serving as general staff officers dealing with complex adaptive military problems."⁴

Due to the fact that the AMEDD has officers serving on general staffs at the operational level, and that the AMSP is the Army's recognized operational planning program, the AMEDD has a need for AMSP trained officers. As mentioned in the introduction of this article, the AMEDD encounters complex problems. These problems often require critical thinking and problem solving skills that are not adequately cultivated within the established Officer Professional Military Development (OPMD) system. The AMSP builds on the established OPMD system by introducing new and cutting-edge ideas and theory which are not traditionally emphasized or taught. This statement is not meant to disparage the experience

or professional training provided to AMEDD officers, but there is a void in how well AMEDD officers are developed to work at the operational level. This void is made apparent in the notes from the Combined Forces Land Component Command Surgeon's Medical Conference in 2004,⁵ and a command interview with the Multi-National Corps-Iraq Surgeon in 2008.⁶ These notes reveal an assessment by AMEDD key leaders that AMEDD personnel are unprepared for duties at the operational and strategic levels. The comments noted in particular the inability of personnel to speak in common military terms rather than medical terms, as well as the difficulty experienced in getting personnel to the right training before filling positions at these levels.

It is our opinion that the AMSP is an appropriate bridge to help fill the previously described void caused by AMEDD officers learning to work on the job at the operational level rather than arriving with the proper education and development experience. The AMSP not only gives AMEDD officers at the operational and strategic levels the tools to understand and craft possible solutions, it does so within a joint and combined setting. Thus, the AMSP-trained AMEDD officer gains knowledge and experience from foreign and sister service officers who attend the AMSP. The program provides the AMEDD student with the opportunity to understand how his or her medical knowledge fits within the overall operational or strategic plans. It also allows AMEDD AMSP graduates to gain insight into how they will go about achieving an understanding of the complex issues faced by operational and strategic level commanders. By sharing in the common AMSP experience, the AMEDD AMSP graduate develops a understanding with other operational level planners where a unique lexicon and procedures are used. Additionally, AMSP graduates establish a network of operational and strategic planners that facilitates coordination and synchronization across command and functional boundaries.

Unfortunately, the traditional AMEDD OPMD system does not provide officers an equivalent forum in which to garner the previously mentioned skills or knowledge. Past experience has shown that on-the-job training or deployment experience also provides limited opportunities to gain such skills. Most officers would argue that the Intermediate Level Education (ILE) program taught at the Fort Leavenworth Command and General Staff College (CGSC), or ILE short-course programs taught at the various installations around the United States, are meant to provide this education for all field grade officers. The CGSC ILE is valuable for exposing field grade officers to the basics of the joint operation planning process and the military decision-

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making process, which in turn better prepares them for serving as a brigade or division staff officer. However, that school does not, nor was it ever meant to, teach the abstract skills necessary for understanding the complex issues found in the contemporary operating environment or future operating environment. SAMS is the premier forum where an AMEDD field grade officer can gain these skills and education.

Some would even argue that the few AMEDD SAMS-trained officers should serve in an AMEDD billet directly upon graduation in order to harness their skills for the AMEDD. This would be a mistake. As mentioned earlier, half of the value of the AMSP is the refinement of the academic experience during the follow-on utilization tour within a division or corps headquarters. The experience gained by implementing what the AMSP has taught within an operational division or corps headquarters would be essential to any AMEDD AMSP graduate's development. The corporate AMEDD body reaps the final benefits by having a well-rounded officer who not only has a full understanding of the operational level of war, but is a competent practitioner of the Army's operational planning processes. This argument was reinforced in an email message (January 7, 2009) to the authors from LTC Raymond "Scott" Dingle, the first AMEDD AMSP graduate, who performed his utilization tour as a 18th Airborne Corps G-3 Planner, responsible for provisional reconstruction teams in Afghanistan:

During my two and a half years here on DA Staff (OTSG OPS)^a...I have been pulled to be lead planner on various projects for SECARMY,^b TSG,^c CSA/VCSA,^d and the SECDEF...they were major medical initiatives (Unified Medical Command, Army Medical Action Plan (WTU^f), JTF CapMED,^g DCOE for TBI and PH,^h and the MEDCOMⁱ Reorganization) that best utilized...the SAMS experience and credentials.

As the Army, including the AMEDD, evolves to meet the diverse and complex problems of the contemporary operating environments and future operating environments, it is imperative that the AMEDD seek to capitalize on what the AMSP can offer to the current and future development of its officers. This can only be achieved by encouraging AMEDD officers who have completed ILE, or are currently enrolled in ILE, to apply for the AMSP. The AMEDD can facilitate this by emphasizing the AMSP to its officers who will be serving in planning positions. This cannot be done solely

by the outreach of AMEDD AMSP graduates to the field. There must be emphasis placed on the program by senior leaders within the AMEDD. If the AMEDD does not make the effort to educate its officers on the benefits of the AMSP, the AMEDD will continue to lag the rest of the Army by not having a core of officers that are skilled in the application of the operational arts.

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a. Department of the Army Staff (Office of the Surgeon General - Operations)

b. Secretary of the Army

c. The Surgeon General

d. Chief of Staff/Vice Chief of Staff of the Army

e. Secretary of Defense

f. Warrior Transition Unit

g. Joint Task Force - National Capital Region Medical

h. Defense Center of Excellence for Psychological Health and Traumatic Brain Injury

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